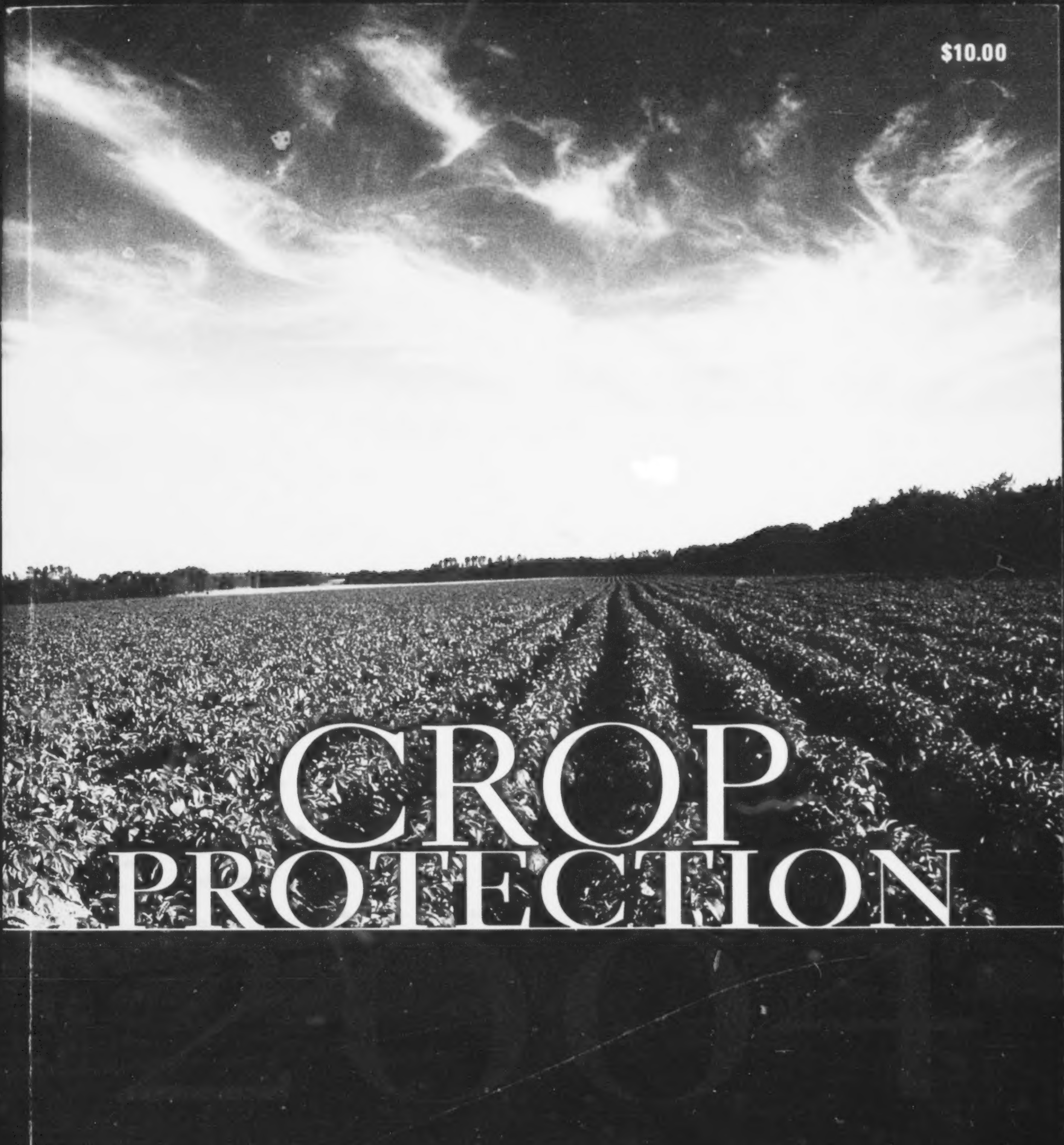

$10.00

CROP PROTECTION

Alberta
AGRICULTURE, FOOD AND
RURAL DEVELOPMENT
AGDEX 606-1

Disclaimer

This publication is intended to be used as a guide only. Information contained here is that available at the time of printing (February 2004). While every effort has been made to ensure accuracy, Alberta Agriculture, Food and Rural Development does not accept responsibility for label changes, errors in conversion or otherwise. It remains the responsibility of the readers to follow product information contained on the product label or package insert. The publisher, editor and all contributors to this publication cannot be held responsible for publication errors or any consequence resulting from the use of this publication.

Note: Some approved minor use registrations may not appear on the product label. Check with product write-up for details.

All recommendations in this publication are given in quantity of commercial product per acre (L or kg/ac). Product labels are given in quantity of product per hectare (L or kg/ha). To avoid application errors, be sure to read and understand label recommendations.

Warning
The use of a pesticide in any manner not published on the label or registered under the *Minor Use of Pesticides* regulation constitutes an offence under both the *Federal Pest Control Products Act* and Alberta's *Environmental Protection and Enhancement Act*.

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Address and Telephone Numbers

Chemical Companies

Abell Pest Control Inc.
636 Notre Dame Avenue
Winnipeg, MB R3B 1S9
(204) 783-3396 Fax: (204) 783-6925

Arvesta Canada, Inc.
998, 105 - 150 Crowfoot Crescent N.W.
Calgary, AB T3G 3T2
Toll Free: 1-866-761-9397
Fax:1-866-231-8957
Website: www.arvesta.com

BASF Canada
345 Carlingview Drive
Toronto, ON M9W 6N9
(416) 675-3611 Toll Free: 1-877-371-2273
Website: www.agproducts.basf.com

Bayer CropScience
#100, 3131 - 114 Avenue S.E.
Calgary, AB T2Z 3X2
1-888-283-6847
Website: www.bayercropscience.ca

Cheminova Canada
5915 Airport Road, Suite 316
Mississauga, ON L4V 1T1
(905) 405-1923 Toll Free: 1-888-316-6260
Website: www.cheminova.com

Apache Seed Co.
10136 - 149 Street
Edmonton, AB T5T 1L1
(780) 489-4245

Dow AgroSciences Canada Inc.
#201, 1144 - 29 Avenue N.E.
Calgary, AB T2E 7P1
Toll Free: 1-800-667-3852
24 Hour Emergency: 1-613-996-6666
Website: www.dowagro.ca

DuPont Canada Inc.
4444 - 72 Avenue S.E.
Calgary, AB T2C 2C1
Toll Free: 1-800-667-3925
Website: www.dupont.ca/ag

Elston Equipment Co. Inc.
Goodwin Enterprises
R.R. 2
Sundre, AB T0M 1X0
(403) 638-3215

Engage Agro Corporation
848 Gordon Street
Guelph, ON N1G 1Y7
(519) 826-7878 Toll Free: 1-800-900-5487
Website: www.engageagro.com

Garden City Ag Supplies
3895 - 9th Avenue N
Lethbridge, AB T1H 6G8
(403) 320-8101 Fax: (403) 320-8041

Gustafson Partnership
#10, 2712 - 37 Avenue N.E.
Calgary, AB T1Y 5L3
(403) 250-9481
24 Hour Emergency: (519) 744-3060
Toll Free: 1-800-880-9481
Website: www.gustafson.com

Interprovincial Co-operatives Ltd.
945 Marion Street
Winnipeg, MB R2J 0K7
(204) 233-3461 Fax: (204) 233-8462
Website: www.ipco.ca

K-9 Cattle Company
Box 1422
Prince Albert, SK S6V 5S9
(306) 764-8102

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Website: www.ipco.ca

K-9 Cattle Company
Box 1422
Prince Albert, SK S6V 5S9
(306) 764-8102

Address and Telephone Numbers – Chemical Companies (cont'd)

Monsanto Canada Inc.
67 Scurfield Blvd.
Winnipeg, MB R3Y 1G4
Toll Free: 1-800-667-4944
Website: www.monsanto.com

Norac Concepts Inc.
P.O. Box 62023
Ottawa, ON K1C 7H8
(613) 841-2907 Fax: (613) 841-2908
24 Hour Emergency: (613) 787-5620
Website: www.noracconcepts.com

Nufarm Canada
5507 - 1st Street S.E.
Calgary, AB T2H 1H9
Toll Free: 1-800-868-5444
Website: www.nufarm.ca

NuGro
10 Craig Street
Brantford, ON N3T 7J1
Toll Free: 1-800-461-7356

Peacock Industries Inc.
Box 577
Hague, SK S0K 1X0
(306) 225-4691 Fax: (306) 225-4600
Website: www.grasshoppercontrol.com

Syngenta Crop Protection Canada Inc.
#300, 6700 MacLeod Trial South
Calgary, AB T2H 0L3
Toll Free: 1-800-665-9250
24 Hour Emergency: 1-800-327-8633
Website: www.syngenta.ca

United Agri Products
Suite 2210, 360 Main Street
Winnipeg, MB R3C 3Z3
24 Hour Emergency: 1-800-561-8273
Website: www.uap.ca

Univar Canada Ltd.
4220 - 78 Avenue S.E.
Calgary, AB T2C 2Z5
(403) 236-1713
Website: www.univarcanada.com

Wilson Laboratories Inc.
36 Head Street
Dundas, ON L9H 3H3
(416) 627-9205

Pest Management Regulatory Agency

The Pest Management Regulatory Agency (PMRA) of Health Canada is responsible for providing safe access to pest management tools, such as pesticides and sustainable pest management strategies, while minimizing risks. The Agency registers all pest control products that may be used in Canada. It also re-evaluates the existing pesticides available to the agriculture, forestry, manufacturing and other sectors. PMRA's risk-management approach to regulatory decision-making involves objective, scientific assessment of the risks to human health and the environment, while considering the need for a pest control product. With this approach, growers and consumers are better protected and have access to the information regulatory decisions are based on.

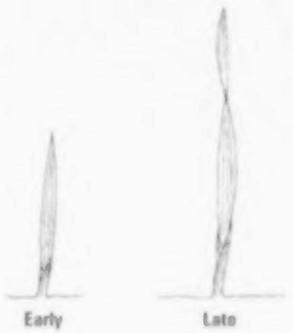
If there are questions or inquiries regarding pesticides, product labels or safety precautions, contact PMRA at the following phone numbers:

Edmonton (780) 495-7014 **Calgary** (403) 292-4106 **Lethbridge** (403) 382-4794

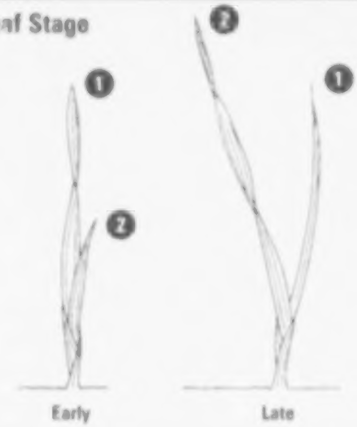
National toll free number: 1-800-267-6315 – Pest Management Information Service
Visit our website: www.hc-sc.gc.ca/pmra-arla

Leaf Stages – Cereals and Grasses

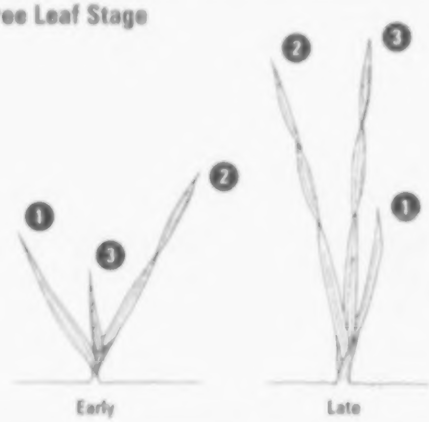
One Leaf Stage



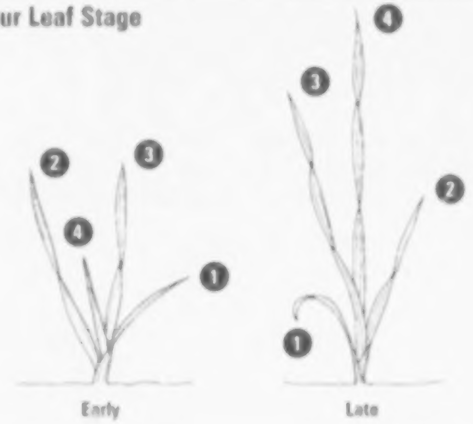
Two Leaf Stage



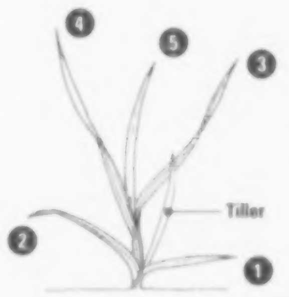
Three Leaf Stage



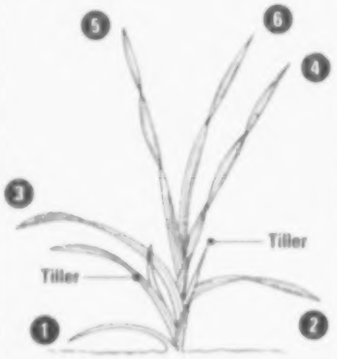
Four Leaf Stage



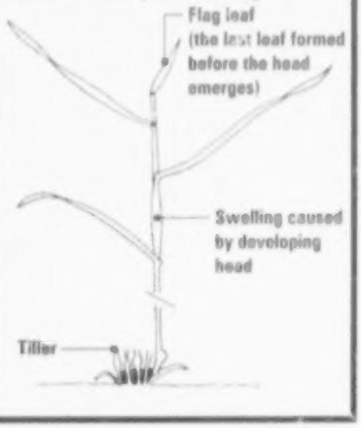
Five Leaf Stage
With one tiller



Six Leaf Stage
With two tillers

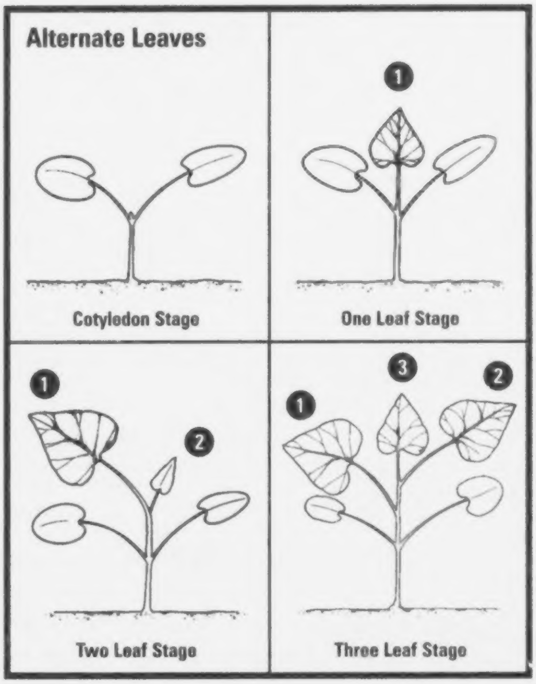


Cereal - Early Boot Stage


Flag leaf
(the last leaf formed before the head emerges)
Swelling caused by developing head
Tiller

Leaf Stages – Broadleaf Weeds

Alternate Leaves



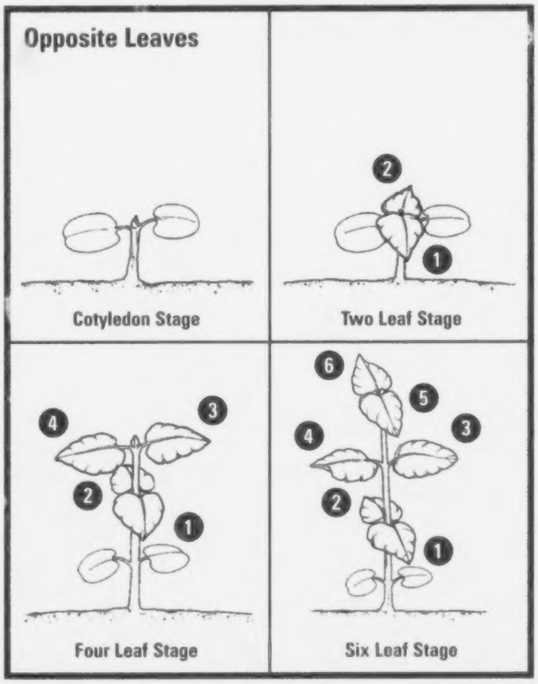
Cotyledon Stage

One Leaf Stage

Two Leaf Stage

Three Leaf Stage

Opposite Leaves



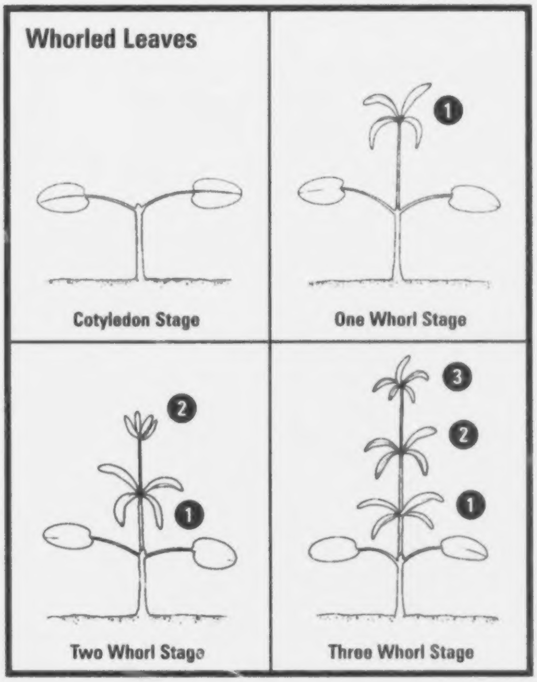
Cotyledon Stage

Two Leaf Stage

Four Leaf Stage

Six Leaf Stage

Whorled Leaves



Cotyledon Stage

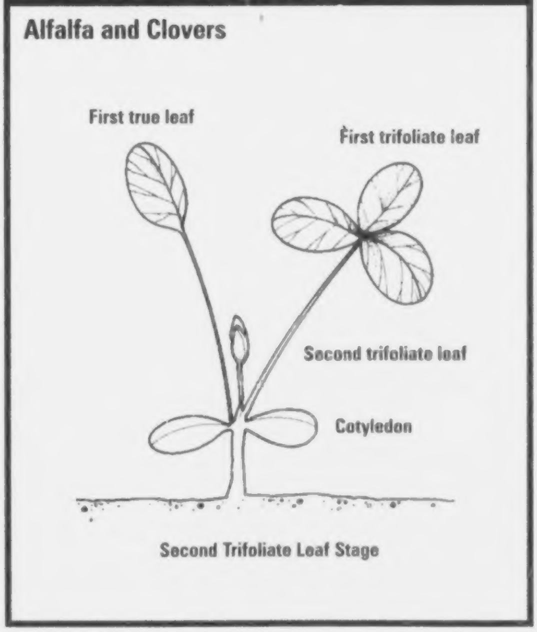
One Whorl Stage

Two Whorl Stage

Three Whorl Stage

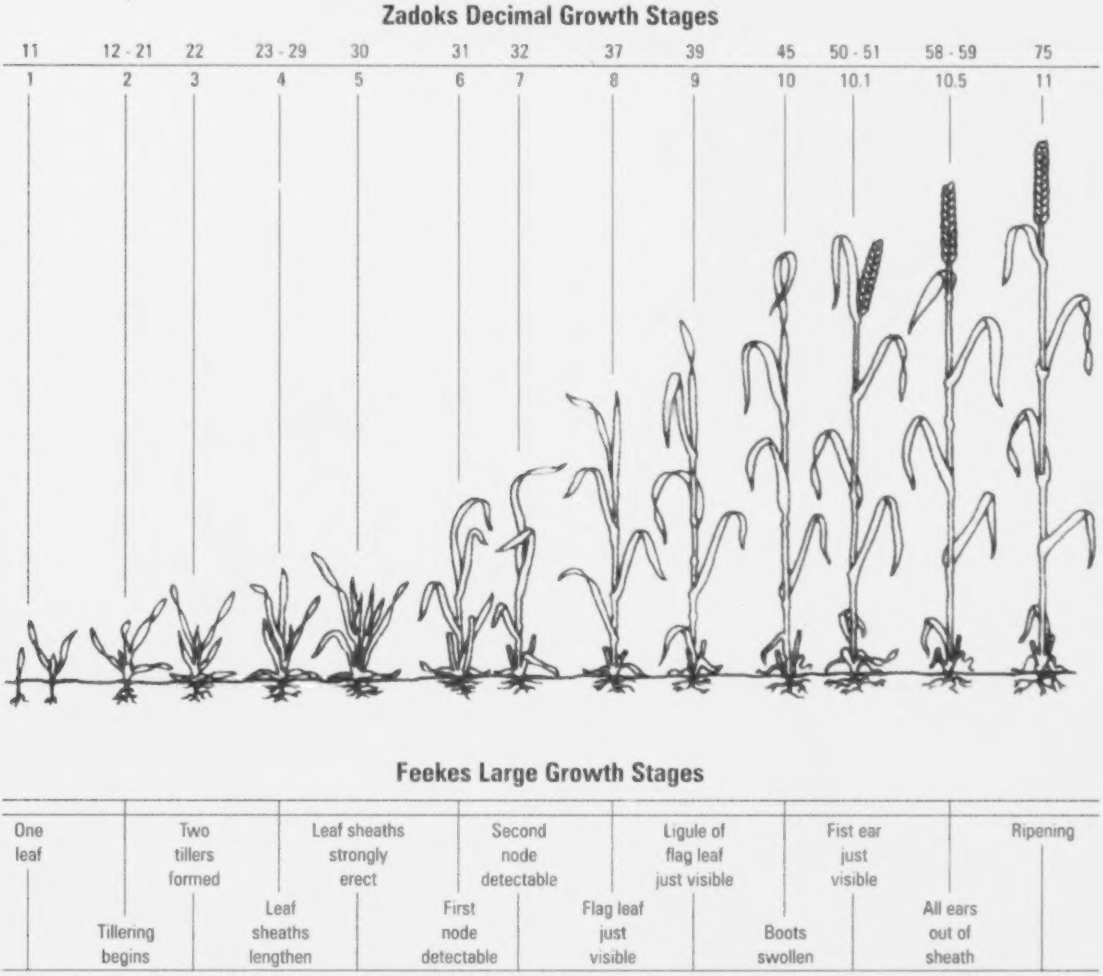
Leaf Stages – Legume Crops

Alfalfa and Clovers



Second Trifoliate Leaf Stage

Cereal Growth Stages



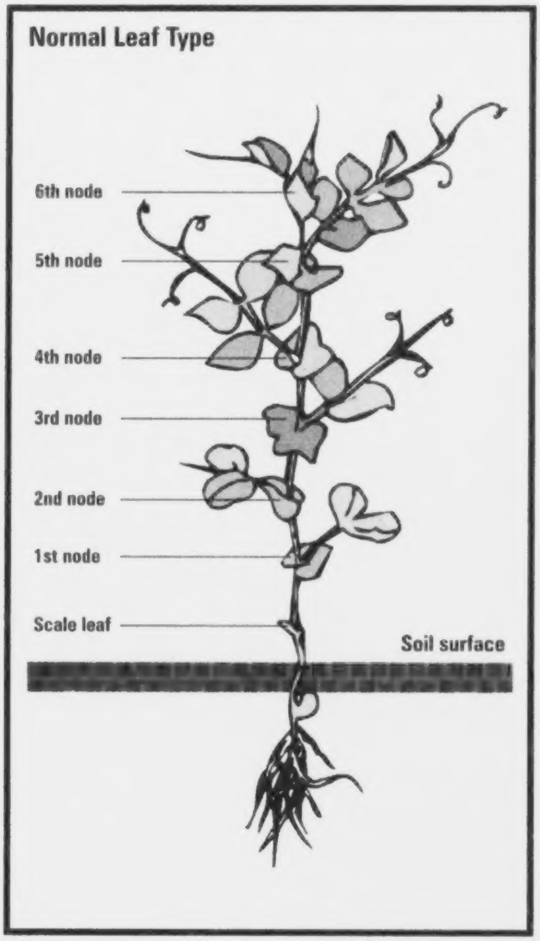
The Feekes and Zadoks scales define the growth stages of a relatively uniform cereal crop. Completion of these growth stages by the cereal crop will be influenced greatly by soil temperature, moisture, air temperature and day length. For example, stages 2 to 5 in the Feekes scale may take 5 or 6 weeks, whereas stages 6 to 10 may be completed in 2 to 3 weeks under prairie conditions.

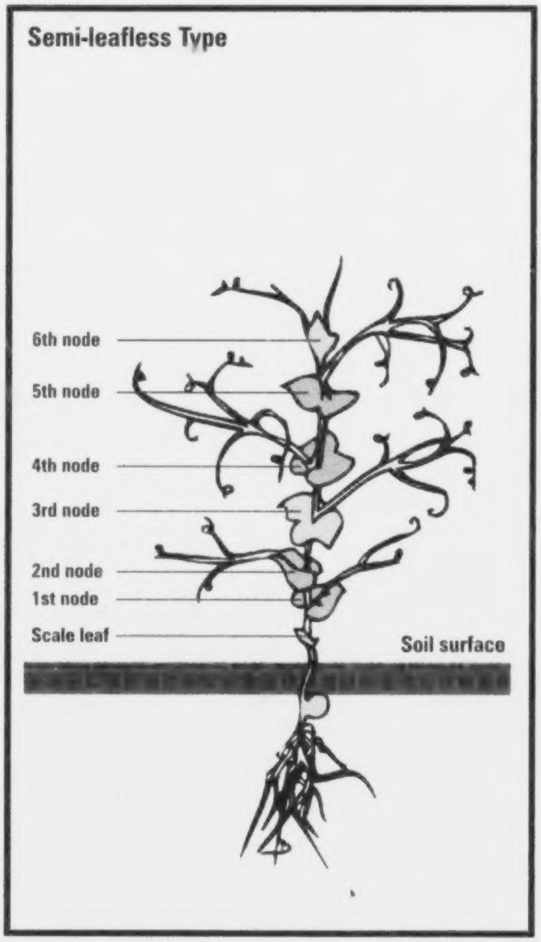
To establish the growth stage of a cereal crop using either of these scales, it is necessary to collect a random sample of plants to determine the level of growth attained by the majority of the plants.

Under good growing conditions, examination of up to 10 random selected plants may be appropriate. Under conditions of uneven germination and low soil moisture, growth stage assessment may require larger samples.

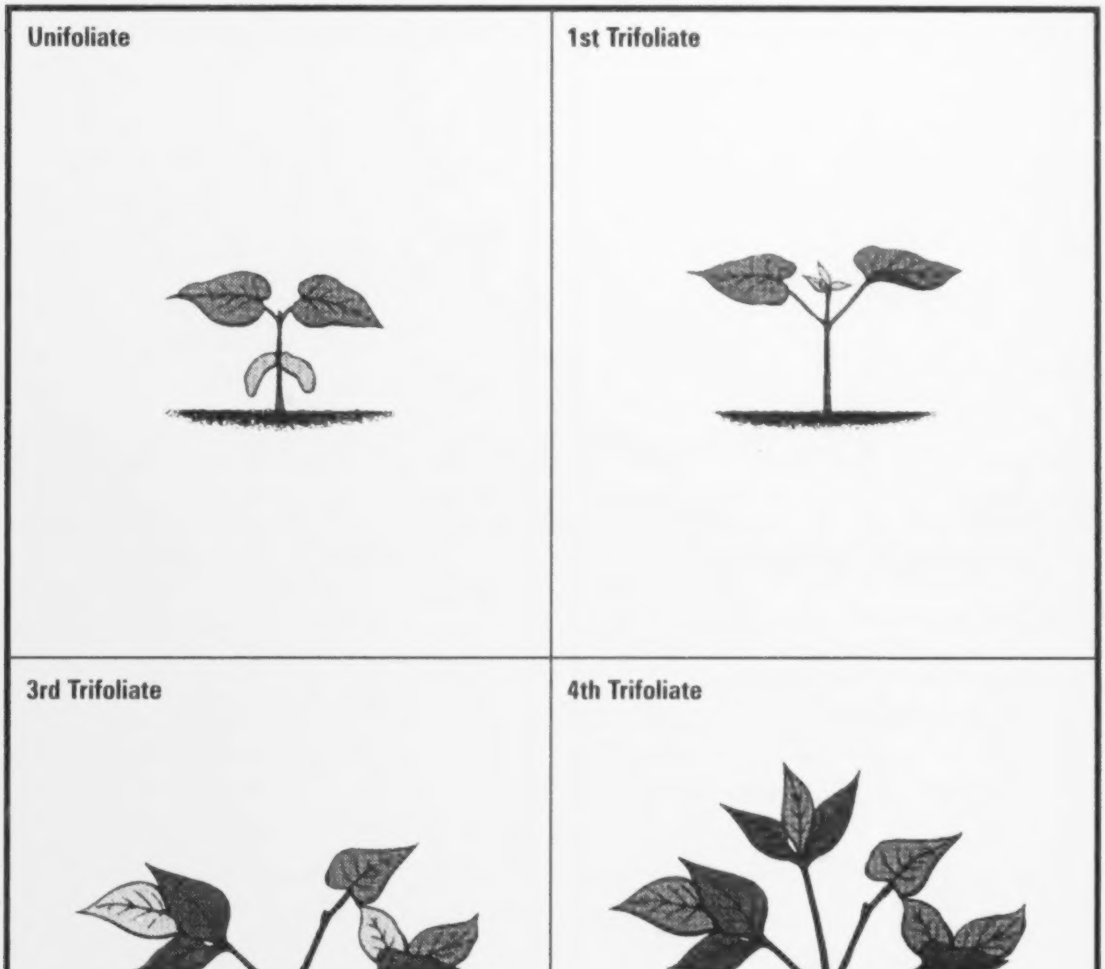
Precise timing of the application of an agrochemical, be it a fungicide, growth regulator, herbicide or supplemental nutrient, is of vital importance in maximizing the desired effect on the target crop. Physiological growth stage, not farming practices based on calendar days, will achieve this desired effect from the agrochemical.

Pea Node Leaf Stages





Bean Leaf Stages



Unifoliate

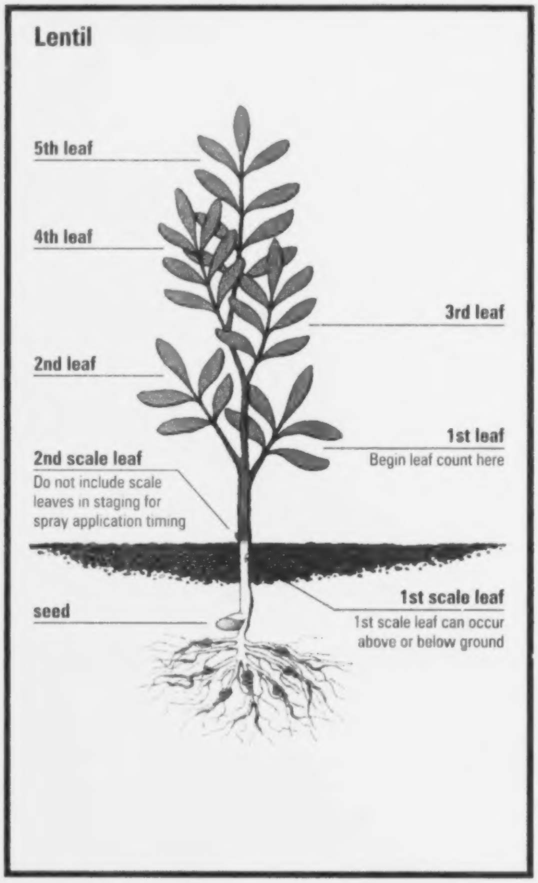
1st Trifoliate

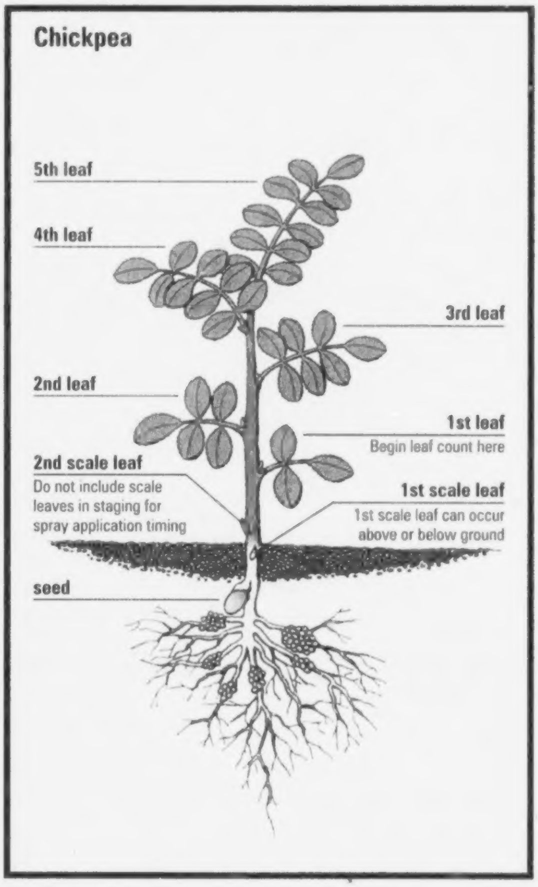
3rd Trifoliate

4th Trifoliate

Source: BASF Canada
Acknowledgement: Technical expertise from Dr. Al Slinkard.

Lentil and Chickpea Leaf Stages


Lentil
5th leaf
4th leaf
3rd leaf
2nd leaf
1st leaf
Begin leaf count here
2nd scale leaf
Do not include scale leaves in staging for spray application timing
seed
1st scale leaf
1st scale leaf can occur above or below ground


Chickpea
5th leaf
4th leaf
3rd leaf
2nd leaf
1st leaf
Begin leaf count here
2nd scale leaf
Do not include scale leaves in staging for spray application timing
1st scale leaf
1st scale leaf can occur above or below ground
seed

Source: BASF Canada

Acknowledgement: Technical expertise from Dr. Al Slinkard.

How to Use This Book

This publication is intended to be of assistance in the selection and application of pesticides. The pesticides are grouped into four main sections: herbicides, insecticides, fungicides and rodenticides. Growth regulators are at the end of the herbicide section, and insecticide/fungicide mixes are included in the fungicide section. Each section is indexed separately.

Use the pesticide selector charts at the end of the book and the detailed pesticide descriptions to choose the most appropriate chemicals. To select a suitable pesticide, follow these steps:

- Identify the pest(s).
- Refer to the chart for weed or insect pests, and record the pesticide(s) available.
- Refer to the appropriate pesticide(s) in the text, and select the product best suited to your operation.
- Apply the pesticide strictly according to instructions given on the label attached to the product container.

Chemical Pest Control Summary

Know your problem(s).

- Indentify the pest(s).
- Estimate infestation level or probable economic loss to determine if treatment is required.
- Know the crop variety. Some products are restricted to, or excluded from, use on specific crop types or varieties.
- If necessary, note soil type or texture of the area to be treated.

If chemical control is necessary, choose a pesticide based on the following criteria:

- Registered products for the given crop (tank mixes may have separate recommendations).
- Pests controlled by the product.
- Crop and pest stage of growth or development.
- Recommended application time (e.g. spring, summer, fall; time of day).
- Cropping and/or harvest restrictions of product(s) considered.
- Use the least toxic, suitable product.

Read product label directions for:

- Recommended rate(s) for the particular pest, infestation level, crop and field conditions.
- Method of application.
- Any application restrictions during adverse or extreme weather conditions.
- Any other restrictions, cautions or special instructions.

Clean, prepare, maintain application equipment.

- Lubricate and repair equipment to get the best possible performance.
- Clean spray tank of residues to prevent crop damage or problems with equipment.
- Clean, calibrate and, if necessary, replace spray nozzles.
- Check pump and pressure system.

Safely prepare pesticides for application.

- Use protective clothing and recommended safety equipment; the exposure hazard is greatest during mixing.
- Follow the mixing instructions.
- Use the specified amount and quality of water.
- Use recommended rates (tank mix rates may be different from each pesticide used alone).
- If specified, add adjuvants.
- Record the following: rates used, mix order, pesticides and adjuvants used as well as water quality for future reference.

Apply pesticides using:

- Recommended safety precautions and equipment.
- Proper application equipment.
- Recommended rates of pesticides, adjuvants and water.
- Proper time (e.g. growth stage, time of day, season).
- Recommended techniques (e.g. ground speed, pressure, incorporation).
- Record weather conditions at time of application, techniques used, growth stage of crop and pests for future reference.

Pesticide Resistance

The Problem

Agricultural pests can develop resistance to fungicides, herbicides or insecticides. Resistance is the result of repeated use of one or more similar pesticides over a number of years. In Alberta, the potential exists for resistance to develop to a number of products. Producers should follow agronomic practices that both prevent or minimize the development of resistance and prevent the spread of existing resistant populations.

Pest biotypes resistant to one or more chemical pesticides occur naturally. Repeated use of either one pesticide or of pesticides with a similar mode of action can result in a build-up of resistance and a loss of control. Pesticide resistant biotypes do not differ in appearance from the susceptible biotypes. Therefore, it is extremely difficult to observe the progression of resistance until a loss of control is observed.

Identifying Resistance

- Loss of control is observed. One pest may escape control while other pest species are controlled.
- Was pesticide performance adversely affected by weather conditions or misapplication?
- Does the field history indicate repeated use of one or more pesticides with a similar mode of action?
- Did the pest infestation occur after pesticide application?

Management Strategies

Producers should attempt to prevent or delay the appearance of resistance through the rotation of both crops and pesticides.

- Keep accurate records of crop rotation and pesticide use.
- Rotate both crops and pesticides. When rotating pesticides, use products with different modes of action.
- Avoid the repeated use of one or more similar pesticides.
- Use clean seed.
- Use pest resistant crop varieties.
- Use cultural pest controls, including tillage where practical.
- Avoid pesticides with long residual activity.

- Follow label directions regarding management practices.
- Use good sanitation practices. Avoid spreading crop seed, weed seed, crop residues or manure from suspicious fields.
- Use mixtures or split applications of pesticides with different modes of action.
- Follow all label directions and restrictions carefully.

Sprayer Operations

A summary of sprayer operations is presented in this publication.

Getting the sprayer ready:

- Preliminary maintenance, adjustments and settings must be made according to the operator's manual.
- The entire sprayer system should be cleaned and rinsed.
- Ensure that all nozzles are the same size and spray angle by checking the code number on the nozzle tip.
- Partially fill sprayer tank with clean water.
- Check the pump for adequate output. If the desired spraying pressure can be achieved with the agitator and boom valves open, the pump output is okay.
- Check accuracy of main sprayer gauge by installing a new gauge on the boom end temporarily and compare the pressure readings. The readings should be identical.
- Inspect spray patterns and replace tips that have streaky patterns. Flat fan nozzles should be aligned, so the patterns do not interfere with each other.

Sample Nozzle Chart

Nozzle number	Pressure kPa	Litres per minute	Litres per acre (50 cm spacing)			
			6 km/h	8 km/h	9 km/h	10 km/h
11001	275	0.38	30	22	20	18
110015	275	0.57	45	34	30	27
11002*	275	0.75	60	45	40	36

* Standard Tips for 40 L/ac at 275 kPa and 9 km/h. For nozzles not included, refer to manufacturer's data or *Pesticide Application Equipment*, Agdex 744-5.

Note: If spray charts are not available for your nozzles, the following formula may be used to establish the ground speed required to apply the desired litres per acre.

Formula:

$$\frac{\text{Average nozzle output (L/min)} \times 240}{\text{Litres per acre} \times \text{nozzle spacing (m)*}} = \text{km/h}$$

* Standard nozzle spacing is 0.5 m.

Example:

$$\frac{0.75\ \text{L/min} \times 240}{40\ \text{L/ac} \times 0.5\ \text{m}} = \frac{180}{20} = 9\ \text{km/h}$$

Nozzle tip calibration

The output of individual nozzles must be within 5 per cent of the average nozzle output to provide an even volume over the width of the spray swath. Nozzles with outputs either above or below this value must be replaced.

- With the spayer operating at the recommended spraying pressure (275 kPa), collect, measure and record the output from each nozzle on the boom for one minute. Note: if nozzle strainers are equipped with ball-check valves, increase pressure by 35 kPa.
- Calculate the average output.
- Replace nozzles with output 5 per cent greater than average. Clean and recheck nozzles with output 5 per cent less than average.

Ground speed determination

Actual ground speed can be confirmed by noting the time it takes to travel a measured distance. The following ground speed chart is based on the time required to travel 800 metres.

Speed (km/h)	Travel time for 800 m (min:sec)
7	6:48
8	6:00
9	5:20
10	4:48
11	4:22
12	4:00

Sprayer Calibration – Example L/Acre

Step 1: Determine the number of acres to spray using your field records.

Example: 30 acres

Step 2: Know the sprayer tank capacity, which is marked on sprayer tank.

Example: 2,000 litres

Step 3: Determine spray volume needed per acre, which can be obtained from the pesticide label or this publication.

Example: 40 litres per acre recommended

Step 4: Select nozzles for 40 litres per acre from the manufacturer's chart or the sample nozzle chart in this publication.

Example: Nozzle No. 11002 at 275 kPa and 9 km/h = 40 L/acre

Step 5: Check nozzle output. See nozzle tip calibration.

Example: Nozzle flow between 0.71 to 0.79 litres per minute per nozzle is okay

Step 6: Calculate total spray solution needed by multiplying number of acres **x** litres per acre.

Example: 30 acres x 40 litres per acre = 1,200 litres

Step 7: Calculate the total amount of pesticide needed from the pesticide label or this publication (multiply litres of pesticide per acre **x** number of acres to spray).

Example: 0.60 L/acre x 30 acres = 18 L of pesticide and 1,182 L of water in sprayer tank

Step 8: Set sprayer to travel at desired speed. See Step 4 (example) and nozzle chart.

Example: Required speed = 9 km/h (36 seconds to travel 90 m)

Standard Benchmarks

Application volume: 40 litres per acre (L/ac) = 100 litres per hectare (L/ha) = 8.8 Imperial gallons per acre

Spraying pressure: 75 kilopascals (kPa) = 40 pounds per square inch (psi)

Speed for spraying: 9 kilometres per hour (km/h) = 5.4 miles per hour (mph)

Nozzle spacing on spray boom: 0.5 m = 20 inches (in.)

Height above target for 80° and 110°
Nozzle tips: 45 centimetres (cm) = 18 inches (in.)
Nozzle tips: 8002 or 11002

Note: A standard nozzle puts out 0.75 litres per minute at 275 kPa. At 9 km/h, these nozzles apply 40 L/ac of spray.

Metric equivalents

1 acre = 0.405 hectare
2.471 acre = 1 hectare
6.9 kPa = 1 psi
1.6 km/h = 1 mph
2.54 cm = 1 in
1 litre/ac = 2.5 litre/ha

Calibrating Small Sprayers

The spray volume that a backpack or hand-held sprayer will apply per acre can be determined by field testing the sprayer on a portion of an acre. The size of the test area commonly used is 1/100 of an acre. It is important that the test area surface is similar to the surface to be sprayed, so the walking speed will remain the same.

Step 1: Establish a test run distance to spray 1/100 acre (40.5 m_2) according to the swath width of the sprayer.

Swath width	**Test run length**
0.5 metres	81.0 metres
1.0 metres	40.5 metres
1.5 metres	27.0 metres
2.0 metres	20.2 metres

Step 2: At a comfortable walking speed, spray the test area and measure the volume of water used (repeat 2 or 3 times to obtain an average). This is the amount applied to 1/100 acre.

Example: 2 litres

Step 3: Multiply the figure arrived at in Step 2 by 100 to get the spray volume per acre.

Example: 2 L x 100 = 200 L/ac

Step 4: Determine the amount of pesticide to add per tank load. Divide the volume applied per acre by tank capacity to determine the number of fills required to spray an acre.

Example: 200 L/ac ÷ 20 L/tank = 10 fills

Divide the chemical rate per acre by the number of tank loads required to spray an acre to determine the amount of product to add per tank load.

Example: 1 L/ac ÷ 10 fills = 0.1 L/tank

Sprayer Clean-out

Reasons for sprayer clean-out

- To prevent crop injury by leftover residues.
- To avoid loss of activity of the next pesticide by leftover residues.
- To stop chemicals from corroding or plugging spray equipment.

Clean the sprayer thoroughly when changing chemicals. Clean all parts – sprayer tank, pump, booms, hoses, strainers and nozzles. Plugged nozzle tips should be cleaned with a soft bristle brush or compressed air. **Never use your mouth to blow a tip clean.**

Reduce waste by mixing only the required volume of spray solution and by spraying or reusing as much of the leftover residue as possible. Select a special site for flushing and cleaning of the sprayer. Do not clean sprayers near creeks, dugouts, sloughs, wells or any other water sources. Ensure that wash water does not come into contact with any desirable vegetation or its roots. Make sure discharged wash water (especially from insecticides) will not be accessible to children or animals. Do not contaminate any watercourse or water body with wash water. **Note:** Pesticides may have specific recommendations for sprayer clean-out. Refer to product labels on the container for recommendations.

Cleaning at day's end

- Drain the tank.
- Open boom ends.
- Flush entire system with clean water.
- Remove and clean nozzle tips and strainers as needed.

Cleaning the sprayer when changing chemicals or for sprayer storage

- A more complete cleaning of the sprayer is needed when changing pesticides. Even a small amount of some pesticides left in the sprayer can create serious damage to subsequently sprayed crops.
- Wash outside of sprayer, then drain the tank completely.
- Remove and clean all strainers and nozzle tips. Open boom-ends.
- Partially fill sprayer tank with clean water, circulate and flush through the booms for at least 10 minutes, then drain. If any visible residues remain, repeat clean water rinse cycle.

- Fill sprayer tank with clean water. Add one litre of household ammonia for every 100 litres of water. Re-circulate the solution through the agitator and/or bypass for at least 15 minutes.
- Spray out and drain completely.
- Repeat the ammonia wash cycle.
- Rinse twice with clean water and drain.

Note: If ammonia is not available, add one of the following alternatives to 100 L of water: 0.5 kg nutrasol or solvental, **or** 1.0 kg trisodium phosphate **or** 0.6 L agral 90. Liquid spray tank cleaner containing potassium hydroxide can also be used.

At end of spraying season

- Add light oil or automobile antifreeze during the final stage of the last rinsing procedure.
- Remove the pump and store it indoors.
- Close all openings into the sprayer to prevent entry of debris or rodents.
- Protect plastic tanks from direct sunlight during storage to ensure longevity.

Preparation and Application of Pesticides

Proper Mixing of Pesticides

1. Fill the sprayer with half the required amount of clean water.
2. Shake the closed pesticide container vigorously.
3. Slowly add pesticide to sprayer with agitator operating.
4. Add the remaining amount of water and spray at once.
5. If tank mixing more than one pesticide, add pesticides to the tank in the order recommended on the label.
6. Triple rinse empty containers and add rinsate to the tank.
7. Always agitate vigorously if sprayer has been standing for a time after mixing.

Adjuvants (surfactants, wetting agents, spreaders, etc.)

Adjuvants are added to a pesticide to enhance application and/or performance. The most common adjuvants used in pesticides are surfactants. If adjuvants are required, use only those products named and recommended on the label. Failure to do so could result in:

- crop injury
- reduced pest control
- invalidation of pesticide warranty

Surfactants facilitate and enhance the emulsifying, dispersing, wetting, spreading, sticking, penetrating or other surface-modifying properties of liquids to bring about enhanced pesticidial action. Because these chemicals produce physical changes at the surface of liquids, surfactants are often referred to as surface-active agents.

Surfactants are generally classified into two major groups based on how they react in water: ionic or non-ionic. Ionic surfactants break down when mixed in water, into two entities – a positively charged ion (cation) and negatively charged ion (anion). An example is ammonium sulphate ($2\ NH_4^+ + SO_4^-$).

Non-ionic surfactants do not break down in water. Consequently, they are unaffected by hard water, can be used in strong acid solutions and are more soluble in cold water than in hot water. Some of the commonly recommended non-ionic surfactants for herbicide mixtures are Agral 90, Ag-Surf, Companion, Citowett Plus, Enhance, Super Spreader-Sticker, Tween 20.

Tank Mixtures

Tank mixtures are two or more separate pesticides mixed in the sprayer tank, as opposed to a mixture formulated by the manufacturer. For example, wild oat herbicides are frequently mixed with a broadleaf herbicide to control a wide range of weeds.

Rate to use in preparing a tank mix

Always check the product labels for the recommended tank mix rates. Generally, add the amount you would use if each pesticide was applied separately, but there are exceptions. Generalizations may be dangerous to your wallet and your crop.

Preparing a tank mix

To avoid physical incompatibilities, go through the following steps:

- add half the required amount of water and mix with one pesticide
- agitate
- with agitator running, add the other pesticide. Add pesticides to the spray tank in the following order to reduce the possibility of formation of precipitates or gums that may clog nozzles and filters:
  - soluble powders
  - wettable powders and flowable liquids
  - solutions (amines and salts)
  - additives (surfactants)
  - emulsifiable concentrates (esters)

For specific mixing instructions, always check the product labels as there may be exceptions to these guidelines.

Avoid tank mix problems

Check the labels for recommended crops, pests and rates for tank mixes as they may be restricted compared to the recommendations for each individual product. For example, either Poast or MCPA Amine alone can be used on several crops. A Poast + MCPA Amine tank mix can only be used on flax.

Crop injury, reduced pest control or physical incompatabilities may be the result of using tank mixes improperly. When herbicides for grassy weed control are mixed with herbicides for broadleaf weed control, a partial loss (sometimes total loss) of activity on grassy weed control is quite common. When reduced weed control or crop injury is likely to occur, the advantages of tank mixing are soon lost.

- Tank mix properties are not necessarily the same as those of the individual pesticides applied separately.
- Use registered tank mixes only.
- Check the labels for recommended crops, pests, rates and adjuvants for tank mixing.
- Follow label directions for preparing the mix.
- Use only on crops or varieties registered for the particular tank mix.
- Apply at the recommended stage of growth or development of crop and pest(s).

What to Do if Results Are Unsatisfactory

- Ensure the choice of pesticide(s) was suitable. Are the treated crops and pests listed on the product label(s)?
- Compare your method of pesticide preparation to the product label(s) instructions.
- Check for equipment malfunction – e.g. plugged screens, nozzles worn or mixed type or size.
- Compare your application techniques with those given on label(s) – e.g. stage of growth or development of crop and pest(s), ground speed, pressure and incorporation.
- Consider weather conditions at application time – several labels include cautions against application during weather extremes – e.g. cold, heat, drought.

- Consider time since application. Some results are not apparent for several days. Look for early symptoms of the chemical taking effect.
- If results are unsatisfactory, seek technical help. Gather all relevant data, particularly evidence such as photos or specimens. Record wind, rainfall, soil moisture condition, crop variety, fertility, quantity of material used, acres treated and temperature at time of spraying.
- Document everything in writing. If crop damage is involved, submit a specimen for diagnosis. Disease or insect damage can resemble herbicide injury.

Reporting a Complaint

Farmers who are present during an application and have observed that drift of pesticide has occurred on their property should take the following actions to assist in any investigation that may take place at a later date.

- Record as much detail on the application equipment as possible (i.e. colour, make, call numbers of aircraft, etc.). If possible, take photographs.
- Write down everything you can recall of the incident (including time of the occurrence, weather conditions at the time, other people who may have witnessed the incident, other people the farmer may have talked to about the incident and their responses, etc.).
- Contact Alberta Environment at the 24-hour environmental complaint number at 1-800-222-6514 or #PERT (#7378) on Telus Mobility.

Pesticide Applicator Certificate

Anyone applying pesticides (herbicides, insecticides, fungicides or rodenticides) in exchange for a fee must be certified and hold a Pesticide Service Registration issued by Alberta Environment. If someone is offering to spray your property, ask to see a Pesticide Service Registration and a Pesticide Applicator Certificate (all applicators are issued wallet-size identification cards).

For questions pertaining to pesticide applicator certification, please call Lakeland College at 1-800-853-8648. For questions pertaining to service registrations, contact the nearest regional office of Alberta Environment.

Please remember that a certificate is not a guarantee of performance. A certificate only certifies that the certificate holder has met a minimum standard of knowledge; it cannot assess an applicator's integrity or the honesty of his business practices. If you are uncertain about the reliability of a particular applicator, ask for references.

Farmer Certification Requirements

The Federal Pest Management Regulatory Agency (PMRA), in consultation with the provincial agriculture and environment departments across Canada, has agreed that some pesticides have unique hazard characteristics and require the applicator (producer) to be knowledgeable to use them. This means that producers will be required to take a course and become certified to purchase and use certain hazardous pesticides on their own property. Certification ensures that producers are familiar with the hazardous characteristics of the pesticide(s) and with the safety requirements to ensure a safe application. Mandatory certification for producers to use certain pesticides is currently only applicable in Alberta for:

- Aluminum phosphide (Phostoxin, Gastoxin)
- Picloram (Tordon)

Producers must present a valid applicator certificate to the vendor at the time of purchase. Producers are encouraged to contact Olds College Extension Services at 1-800-661-6537 to obtain further information about the producer certification course.

Note: The producer certification course offered by Olds College does not qualify a producer to apply pesticides for hire or reward for his neighbours or other people as defined under Alberta's *Environmental Protection Act*. Producers wanting to become commercial pesticide applicators should contact Lakeland College at 1-866-853-8646.

Pesticide User Responsibility

Pesticide drift

Pesticide drift is a concern for ground as well as aerial application. Landowners are responsible for ensuring that any pesticide applications conducted on their property are conducted in a safe, responsible manner.

- The choice of chemical should be made with adjacent land uses in mind. If neighbours have livestock, bees, shelterbelts and gardens that may be affected by off-target drift, they should be consulted prior to application. Perhaps a different chemical, formulation or application method will provide the same control and greater compatibility with neighbouring land uses.
- All sprayers (ground or air) should be calibrated prior to use, taking into consideration nozzle type, nozzle pressure and boom height. Calibration will assure better performance as well as reducing the risk of chemical drift. If you are hiring a custom applicator, be sure to ask when the equipment was last calibrated, and be sure to check during the application to see whether any visible drift is occuring.
- Buffer strips should be left when applying pesticides next to sensitive crops and farmsteads. The size of these strips will depend on the chemical used, the application method and the degree of risk from escaping drift. Pesticide applications conducted near rivers, creeks, lakes, irrigation canals or other open bodies of water require extra care and caution to ensure water users will not be affected by the proposed pesticide application and that the application is conducted in a manner that will not adversely affect aquatic or riparian habitats. Ideally, natural vegetation should be left along natural water bodies to ensure bank stability and to provide a natural buffer and filter for agricultural chemicals. A permit must be obtained from Alberta Environment to perform pesticide applications within this 30-metre area.
- Pesticides should not be sprayed when winds are excessive (generally winds over 16 km/hr are considered a drift hazard). Pesticides should only be sprayed when winds are blowing away from farmsteads, sensitive crops or water bodies. Conditions of "dead-calm" or temperature inversions should also be avoided to prevent vapour clouds. A suitable drift retardant additive to the spray tank may help reduce the potential drift hazard associated with the spraying of pesticides.
- Always assess the risk to adjacent landowners, and never push weather conditions to meet deadlines. If completing an application as planned may mean damaging your neighbour's property, postpone the application or modify it to prevent off-target damage. Landowners can be held liable for pesticide drift even if a custom applicator was hired to perform the application. When you hire a custom applicator, it is important that you hire a company that is registered, operates with certified applicators and has the knowledge, equipment, experience and desire to perform an application properly. Custom applicators must be aware of neighbouring residences and sensitive crops, (including gardens, livestock, bees, shelterbelts and gardens) that could present problems if drift should occur.
- All pesticide users, commercial pesticide applicators and farmers are legally responsible for safe pesticide use. Farmers who cause damage from their pesticide application activities or who counsel a commercial pesticide service to conduct either an illegal pesticide application or an application under questionable circumstances (e.g. extremely windy conditions) that results in damage, can be held liable for compensation and face potential prosecution. **Farmers are cautioned** not to counsel commercial applicators to apply pesticides not registered for the use intended or to direct applications to occur under known circumstances that could cause damage (such as under windy conditions). Results of such actions could cost you time and money by having to appear in court to answer to charges or through the subsequent remediation of damaged crops, shelterbelts, gardens, etc.

Notification of neighbours before applying pesticides

- Notifying your neighbours before you or a custom application service begins spraying for you is **not** a legislated requirement; however, it is **strongly recommended and good practice**, particularly if your fields border your neighbours farmstead or other sensitive areas (e.g. where beehives, gardens or shelterbelts may be located). Many potentially harmful situations may be avoided if you talk to your neighbour and advise what and when you anticipate spraying. Let them know whether you will be spraying by ground or by air (noise from low flying aircraft has been known to cause panic in livestock), and ask if your neighbour is planning any events (e.g. family reunions/picnics) where larger numbers of people may be gathered and could potentially be exposed to pesticides from your application. By notifying your neighbours, you are not seeking their consent, but rather letting them know you are concerned about them and their property and want them to be able to take whatever action they believe is necessary before spraying to reduce the potential exposure to the pesticide.

Disposal of pesticide treated seed

Seed treated with a fungicide, fungicide mixture or fungicide/insecticide combination can be very toxic and should be treated with respect. A blue or red colouration on seed indicates it is pesticide-treated. Extra care must be taken during the transport and disposal of pesticide treated seed to prevent domestic animals, birds and other wildlife from consuming the treated seed.

Treated seed is very hazardous to birds. Any left lying on the ground can be eaten by birds, killing them. Be sure treated seed is properly seeded and never leave surplus seed unburied. Spills of treated seed, such as from trucks lurching, can be enough to kill deer or cattle. Treated seed blowing off along the road can kill many birds.

Cover granular pesticides with soil immediately after application to prevent birds and other wildlife from being able to consume them.

Spillage

Move treated seed, particularly insecticide treated seed, in labelled, marked bags. Open container transport is not recommended. Bags should be checked for damage, and containers should be sealed or lined with plastic or other suitable material. Truckloads of seed should be tarped down securely to avoid any possible highway spillage. All treated seed and seed treatment residue should be placed into the seeder at planting time – never dumped in a field.

Disposal

Normally, treated seed is planted within one or two years of treatment. If there is treated seed, either bagged or loose that is either considered too old or too low in germination, then consider its disposal. Such treated seed should be mixed with new seed and planted at higher rates or seeded by itself. For example "old canola seed" can be mixed and sown with new canola seed or overseed alone along field margins or low areas. If disposal is necessary, check with your local landfill authority before disposing in a sanitary landfill. Ensure that the treated seed is covered immediately after dumping.

Pesticide disposal

Unwanted or out-of-date pesticides should be disposed of very safely and responsibly. Pesticides are hazardous wastes and cannot be disposed of in sanitary landfills or by burning. If you will not be able to use pesticide supplies, check to see whether a neighbour may have some use for them. Pesticides that have no further use must be disposed of through a qualified (approved) hazardous waste disposal firm. Names of companies that are licenced to handle hazardous waste can be obtained by contacting Alberta Environment's Recycle Information Line at 1-800-463-6326.

In 2004, a program called Operation CleanFarm will be operating in the southern Alberta region to enable farmers to dispose of old and obsolete pesticides at no cost. Watch your mailbox and local newspapers for more information on collection dates and sites, or check the Operation CleanFarm website at: http://www3.gov.ab.ca/env/protenf/pesticide/cleanfarm/index.html

Water protection

- The preservation of water quality is critical to our sustained quality of life and agricultural production.
- Pesticides must **not** be stored, mixed or applicaton equipment cleaned within 30 metres of an open body of water.
- Pesticides subject to leaching should not be used on coarse-textured soils (i.e. sandy or gravelly) to prevent groundwater contamination.
- Never store pesticides in well houses.
- Haul water to your sprayer and fill it in the field rather than taking the sprayer near the water source.
- Do not leave sprayers unattended while filling.

Pesticide container disposal

Triple rinsing or pressure rinsing of pesticide containers is the recommended method of cleaning pesticide containers prior to disposal. Triple rinsing renders used pesticide containers (metal, plastic, glass) more than 99 per cent free (less than 1 ppm) of residues in most cases. There are a number of systems for pressure rinsing. The simpler style consists of a hollow spike connected to a water line, which injects water under pressure into the jug, which is then drained into the spray tank. A newer style consists of a small hopper mounted right on the sprayer with a sharp metal jug opener and a pressure rinse nozzle in the bottom of the hopper. The full jug is inserted on the jug opener, which drains the chemical into the tank. Wash water is injected under pressure to rinse the container. The chemical and rinse solution is then pumped into the spray tank by direct hose connections.

Unrinsed containers have the potential to contaminate soil, ground water and surface water, and can be toxic to fish and wildlife. Unrinsed containers impede the processing and recycling of empty pesticide containers, as containers have to be emptied, and workers are exposed to the residue. Residues can be transported to the atmosphere during storage, processing, shipping and energy recovery, or they can contaminate end products from plastic recycling processes. In addition, it is estimated that 6 to 7 per cent of product can be left in unrinsed containers. This amount of material can treat 1/2 to 1 acre of land and can result in several dollars of savings.

Containers disposed of at a container collection site are to be clean (triple rinsed or pressured rinsed) and well drained (dry). Paper bags and cardboard containers that contained pesticides should be thoroughly emptied and disposed of at a sanitary landfill. **Do not burn paper bags or cardboard containers**.

Under the Alberta *Environmental Protection and Enhancement Act*, non-refillable plastic or metal pesticide containers (restricted, agricultural and industrial products) must be disposed of at a pesticide container collection site.

Outer packaging (cardboard box) can be disposed of in a regular landfill or recycled if non-contaminated. Some pesticide container sites have bins or separate areas for collecting outer packaging materials.

Steps to follow for manual triple rinsing

(without using a pressure rinse system):

- Empty contents of the container into the spray tank and drain in a vertical position for 30 seconds.
- Add water to container to about 1/5 full.
- Shake the container thoroughly and empty into the spray tank, and drain for 30 seconds.
- Repeat the procedure two more times; it should only take about 5 minutes in total.
- Triple rinsed containers should be punctured or broken to render them non-reusable. Punctured containers also identify themselves as being triple rinsed. **Note:** Do not puncture unrinsed containers – pesticide from unrinsed containers is concentrated material, and puncturing unrinsed containers will cause them to leak and create exposure of the concentrated material to the environment and to persons handling the containers.
- Dispose of all plastic and metal containers at a pesticide container collection site (see list).

Pesticide spill cleanup

In the event of a pesticide spill, follow the steps listed below:

- Isolate affected area.
- Put on protective clothing and equipment.
- Ventilate the area (if indoors). For outdoor spills, work from the upwind side of the spill.
- If possible, stop the containers from further leaking.
- Contain the spread of the spill using soil, sand bags, vermiculite, kitty litter, etc. to provide a barrier to the spread of the spill. Prevent pesticide entry into sewers or water supply.
- Clean up the spilled pesticide. Absorb spill on paper, sand, dirt or other inert material (e.g. kitty litter). Wash site with detergent or other cleaning products such as ammonia. Check the product label or contact the manufacturer for advice on cleanup procedures (most products have a 1-800 customer service number on the label). Dispose of all absorbant materials in an approved landfill. If the spill is large, evacuate the area and notify safety personnel.

Contact Alberta Environment, Environmental Services for more information.

Emergencies or spills can be reported to the 24 hour environmental emergency/complaint telephone number: 1-800-222-6514.

Pesticide Container Site Locations

Municipality	Site	Legal land location	Contact
Acadia #34, MD of	Acadia Valley Landfill	NW7-25-1-W4	Gary Peers (403) 972-3755
Athabasca #12, County of	Colinton Waste Transfer Station	NE7-65-22-W4	Ron Jackson (780) 675-2273
Barrhead #11, County of	Barrhead Landfill	SW3-60-4-W5	Marilyn Flock (780) 674-3331
Beaver County	Ryley Regional Landfill	NE10-50-17-W4	Martin Baert (780) 663-3730
Beaver County	Viking Waste Transfer Station	NE31-47-12-W4	Martin Baert (780) 663-3730
Big Lakes, MD of	High Prairie Regional Landfill	NW9-73-15-W5	Gary Braithwaite (780) 523-6570
Birch Hills County	Peoria Landfill	NW3-77-2-W6	Dean Cooper (780) 694-3793
Birch Hills County	Tangent Landfill	NE36-78-25-W5	Dean Cooper (780) 694-3793
Bonnyville #87, MD of	Bonnyville Seed Cleaning Plant	NW18-61-5-W4	George Vachon (780) 826-3951
Bonnyville #87, MD of	Goodridge Landfill	SW4-63-9-W4	George Vachon (780) 826-3951
Brazeau #77, MD of	Drayton Valley – Brazeau Reg. Landfill	SE20-49-7-W5	Mandee Wilson (780) 542-7777
Calgary, City of	Calgary Forest Lawn Landfill (Includes MD #44)	3801-68 St. S.E. Calgary	Jasna Hundai (403) 230-6617
Camrose #22, County of	Camrose Regional Landfill	NE16-46-20-W4	Paul King (780) 672-4765
Camrose #22, County of	Ferintosh West Dried Meat Lake Landfill Authority	SW14-44-21-W4	Paul King (780) 672-4765
Cardston County	Spring Coulee Waste Transfer Station	SW32-4-23-W4	Rod Foggin (403) 653-4977
Clear Hills #21, MD of	Worsley Landfill	SE25-87-8-W6	Marilyn Ray (780) 685-3925
Clearwater County	Rocky Mountain House Waste Transfer Station	SE2-39-5-W5	Kim Nielsen (403) 845-4444
Cypress County	Irvine Waste Transfer Station	NE31-11-2-W4	Doug Henderson (403) 526-2888
Cypress County	Medicine Hat – Lakeside Milling	NE21-12-6-W4	Doug Henderson (403) 526-2888
Cypress County	Schuler Waste Transfer Station	SE20-16-1-W4	Doug Henderson (403) 526-2888
Drumheller, Town of	Drumheller Regional Landfill.	2490 South Railway Ave	Tammi Nygaard (403) 832-1345
Edmonton, City of	Edmonton Clover Bar Landfill	SW28-53-23-W4	Randy Clark (780) 496-6681
Northern Sunrise County	Nampa Waste Transfer Station	E19-81-20-W5	Audrey Gall (780) 322-3831
Northern Sunrise County	St. Isidore Landfill	SW2-84-20-W5	Audrey Gall (780) 322-3831
Fairview #136, MD of	Fairview Landfill	SW27-82-3-W6	Patricia O'Hara (780) 835-4903
Flagstaff County	Sedgewick Flagstaff Reg. Landfill	SW11-45-12-W4	Doug Munroe (780) 384-3950
Foothills #31, MD of	Okotoks Foothills Reg. Landfill	SE32-19-29-W4	Ron Stead (403) 652-2341
Forty Mile #8, County of	Bow Island Landfill	SE23-11-11-W4	Jon Hood (403) 867-3530
Forty Mile #8, County of	Foremost Waste Transfer Station	NW19-6-11-W4	Jon Hood (403) 867-3530
Grande Prairie #1, County of	Clairmont Landfill	NW27-72-6-W6	Tarolyn Aaserud-Peach (780) 532-9722
Greenview #16, MD of	Valleyview MD Yard	NW10-70-22-W5	Normand Boulet (780) 524-4445
Kneehill County	Three Hills Waste Transfer Station	SW25-31-24-W4	Bruce Sommerville (403) 443-5541

Municipality	Site	Legal land location	Contact
Lac Ste. Anne County	Gunn Lac Ste. Anne Reg. Landfill	NE18-55-3-W5	Allan Deutsch (780) 785-3411
Lacombe County	Eckville Waste Transfer Station	NW34-39-3-W5	Keith Boras (403) 782-6601
Lacombe County	Mirror-Alix Waste Transfer Station	NW24-40-23-W4	Keith Boras (403) 782-6601
Lacombe County	Prentiss Waste Transfer Station	NW7-40-25-W4	Keith Boras (403) 782-6601
Lakeland County	Lac La Biche Landfill	NW36-66-13-W4	Barry Kolenosky (780) 623-4468
Lamont County	Lamont Regional Landfill	NW7-56-18-W4	Terry Eleniak (780) 895-2585
Leduc County	Nisku Sewage Transfer Station	SW31-50-24-W4	Rick Thomas (780) 955-3555
Leduc County	Thorsby County Yard	SE17-49-1-W5	Rick Thomas (780) 955-3555
Lesser Slave River #124, MD of	Flatbush Waste Transfer Station	NW36-65-2-W5	Russ Jassman (780) 681-3929
Lethbridge #26, County of	Coaldale Waste Transfer Station	SW23-9-20-W4	Duane Charlesworth (403) 328-5525
Lethbridge #26, County of	Iron Springs Waste Transfer Station	SW27-11-20-W4	Duane Charlesworth (403) 328-5525
Lethbridge #26, County of	Nobleford Waste Transfer Station	SE10-11-23-W4	Duane Charlesworth (403) 328-5525
Lethbridge #26, County of	Picture Butte Waste Transfer Station	NW27-10-21-W4	Duane Charlesworth (403) 328-5525
MacKenzie #23, MD of	High Level Regional Landfill	SE1-110-20-W5	Grant Smith (780) 927-3717
Minburn #27, County of	Mannville Landfill	SW16-50-9-W4	Darwin Ullery (780) 632-4033
Minburn #27, County of	Vegreville Landfill	NW21-52-14-W4	Darwin Ullery (780) 632-4033
Mountain View County	Didsbury – (near airport)	SW5-32-1-W5	Larry Rice (403) 335-3311
Newell #4, County of	Newell Regional Landfill	SE34-19-15-W4	Ray Juska (403) 362-2651
Northern Lights #22, MD of	Dixonville Long Lake Reg. Landfill	NW3-86-24-W5	Terry Schamehorn (780) 836-3348
Paintearth #18, County of	Castor Waste Transfer Station	SW3-38-14-W4	Jeff Cosens (403) 882-3211
Paintearth #18, County of	Coronation (Paintearth Resource Recovery Centre)	NE34-36-11-W4	Jeff Cosens (403) 882-3211
Parkland County	Stony Plain Landfill	SE35-52-1-W5	Mark Cardinal (780) 968-8467
Parkland County	TomahawkCounty Yard	SW13-51-5-W5	Mark Cardinal (780) 968-8467
Peace #135, MD of	Griffin Creek Landfill	SW18-81-25-W5	Patricia O'Hara (780) 338-3845
Pincher Creek #9, MD of	Cowley (Regional Landfill)	NW8-7-1-W5	Alan Jacklin (403) 627-3130
Pincher Creek #9, MD of	Pincher Station	SW1-7-30-W4	Alan Jacklin (403) 627-3130
Ponoka County	Bluffton Landfill	NE6-44-2-W5	Robert Zimmer (403) 783-3333
Ponoka County	Ponoka Waste Transfer Station	NE36-42-25-W4	Robert Zimmer (403) 783-3333
Provost #52, MD of	Provost Regional Landfill	SW3-40-3-W4	Burt Forbes (780) 753-2368
Red Deer County	Kevisville Waste Transfer Station	NE20-35-2-W5	Art Preachuk (403) 350-2163
Rocky View #44, MD of	Forest Lawn Landfill (City of Calgary)	3801-68 St. S.E. Calgary	Tim Dietzler (403) 230-1401
Saddle Hills County	Gordondale Landfill	SE25-79-11-W6	John Knoot (780) 864-3760
Smoky Lake County	Smoky Lake Landfill	NW2-60-17-W4	Jeff Warawa (780) 656-3730
Smoky River #130, MD of	Falher Landfill	NW15-78-21-W5	Shelleen Gerbig (780) 837-2222
Special Area #2	Bindloss Waste Transfer Station	SE24-22-3-W4	George Aaserud (403) 854-5627
Special Area #2	Hanna Waste Transfer Station	NW16-31-14-W4	George Aaserud (403) 854-5627

Municipality	Site	Legal land location	Contact
Special Area #3	Oyen Waste Transfer Station	LSD3-27-27-4-W4	Bill Kolkman (403) 664-3618
Special Area #3	Youngstown Big Country Regional Landfill	SE29-29-9-W4	Bill Kolkman (403) 664-3618
Special Area #4	Monitor Waste Transfer Station	NW32-34-4-W4	Jordan Christianson (403) 577-3523
Spirit River #133, MD of	MD of Spirit River Landfill	SW31-77-5-W6	Julie Shaw (780) 864-3500
St. Paul #19, County of	Mallaig Waste Transfer Station	NE24-60-10-W4	Dennis Bergheim (780) 645-3301
St. Paul #19, County of	St. Paul Seed Cleaning Plant	SE16-58-9-W4	Dennis Bergheim (780) 645-3301
Starland County	Rumsey Waste Transfer Station	SW24-33-21-W4	Alan Hampton (403) 772-3793
Starland County	Michichi Waste Transfer Station	NW19-30-18-W4	Alan Hampton (403) 772-3793
Stettler #6, County of	Stettler Regional Landfill	NW22-40-19-W4	Walt Saar (403) 742-4441
Strathcona County	Fort Sask. Recycling Station	11121-88 Ave. Ft. Sask.	Kevin Glebe (780) 417-7130
Sturgeon County	Sturgeon Regional Landfill(Roseridge Waste Mgmt)	SW36-55-25-W4	Bernadette Wood (780) 939-5678
Taber, MD of	Enchant Waste Transfer Station	NW16-14-18-W4	Derrick Krizsan (403) 223-8735
Taber, MD of	Grassy Lake Waste Transfer Station	NW23-9-13-W4	Derrick Krizsan (403) 223-8735
Taber, MD of	Vauxhall Waste Transfer Station	SW12-13-16-W4	Derrick Krizsan (403)223-8735
Thorhild #7, County of	Thorhild	NE5-60-21-W4	Rick Ennis (780) 398-3741
Two Hills #21, County of	Two Hills Regional Landfill	NE5-55-11-W4	John Bidulock (780) 657-3358
Two Hills #21, County of	Willingdon Seed Cleaning Plant	NE1-56-15-W4	John Bidulock (780) 657-3358
Vermilion River #24, County of	Marwayne Waste Transfer Station	SE34-52-3-W4	Dion Burlock (780) 846-2244
Vermilion River #24, County of	Paradise Valley Waste Transfer Station	SW7-47-2-W4	Dion Burlock (780) 846-2244
Vermilion River #24, County of	Vermilion Transfer Station	SW5-51-6-W4	Dion Burlock (780) 846-2244
Vulcan County	Vulcan Waste Transfer Station	SW4-17-24-W4	Kelly Malmberg (403) 485-2241
Wainwright #61, MD of	Wainwright – Crop Tech Agro	SW28-44-6-W4	James Schwindt (780) 842-4454
Warner #5, County of	Border Seed Cleaning Plant	SW29-2-14-W4	Jamie Meeks (403) 642-3636
Warner #5, County of	Sunshine Seed Cleaning Plant	NW12-6-I9-W4	Jamie Meeks (403) 642-3636
Westlock County	Westlock Regional Landfill	NE27-59-26-W4	Dennis Mueller (780) 349-3346
Westlock County	Vimy Waste Transfer Station	SW3-59-24-W4	Dennis Mueller (780) 349-3346
Wetaskiwin #10, County of	Peace Hills Waste Transfer Station	SW29-46-24-W4	Steve Majek (780) 352-3321
Wheatland County	Hussar Waste Transfer Station	NW1-24-20-W4	Russ Muenchrath (403) 934-3321
Wheatland County	Standard Waste Transfer Station	SW10-25-22-W4	Russ Muenchrath (403) 934-3321
Wheatland County	Strathmore Waste Transfer Station	NE34-23-25-W4	Russ Muenchrath (403) 934-3321
Willow Creek #26, MD of	Willow Creek Regional Landfill	NW22-11-26-W4	Fred Goodfellow (403) 687-2603
Woodlands County	Fort Assiniboine MD Yard	SW2-62-6-W5	Dawn Fortin (780) 584-3866
Yellowhead County	Evansburg	Contact Ag. Fieldman	Daryl Switzer (780) 325-3782

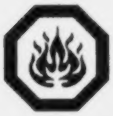
Note: Some municipalities have other "temporary" sites for dropping off empty pesticide containers. Phone municipal contact for locations and operating hours.

Safety Precautions

Warning Symbols

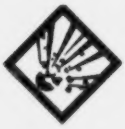
Visual warning symbols on pesticide labels indicate the kind of harm that can result from pesticide misuse or mishandling. They alert the user to the degree of the hazard (by the shape of the border) and to the type of hazard (by the centre picture).

Flammable



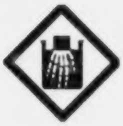
The "fire" symbol is a warning that the pesticide is flammable or easily ignited. Keep the pesticide away from heat, sparks or open flames. Do not smoke while mixing or applying the product.

Explosive



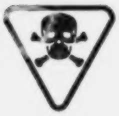
The "exploding grenade" symbol indicates that the pesticide can explode, e.g. pesticide in pressurized cans. Explosive conditions may also be created by using Roundup or Rustler (glyphosate) in a galvanized steel spray tank.

Corrosive



The "corroded hand" symbol indicates that the pesticide is corrosive to the skin and eyes. The chemical is either acid or alkali (caustic) and can burn the skin. Protect the skin and eyes when using these products.

Poisonous



The "skull and crossbones" symbol warns that the chemical is poisonous if taken into the body. Keep the product out of reach of children. Use the appropriate safety measures when dealing with poisonous products.

Pesticide Toxicity, Hazard and Risk

The terms "toxicity," "hazard" and "risk" do not all have the same meanings. Users of pesticides should understand the difference in meanings among these terms.

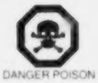
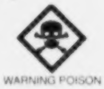
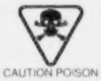
Pesticides vary in **toxicity** or the degree of being poisonous. How poisonous a pesticide is depends on its inherent chemical and physical properties.

The relative **hazard** of a pesticide depends on the toxicity of the pesticide, the dose received and the length of time exposed. No hazard exists when the pesticide container is sealed, but once the seal is broken and the pesticide is handled, exposure can occur, and a hazardous situation is created.

Risk of exposure is a function of how an individual handles the product. Although the hazard may be the same whenever a pesticide is being poured into the spray tank, the risk is different if one person wears a hard hat, goggles, respirator, nitrile gloves, waterproof apron and neoprene or rubber boots and the other person wears none of these. A knowledge of the toxicity of a product and the potential for personal exposure can be used to lower the risk of exposure. The user can control the risk by carefully managing the hazard. Even when highly toxic pesticides are used, if the degree of exposure is kept low enough, the risk can be kept at an acceptable level. The toxicity of the pesticide can't be changed, but the risk can be managed.

LD_{50} values are used to rate the toxicity of the pesticides. The LD_{50} is an abbreviation for the dose (expressed in milligrams per kilogram of body weight of the test animal) that is lethal to 50 per

The following table relates the oral LD_{50} value (mg/kg) of a pesticide to its toxicity symbol.

LD_{50} less than 500 mg/kg indicates high toxicity 	LD_{50} 500 - 1,000 mg/kg indicates moderate toxicity 	LD_{50} 1,000 - 2,500 mg/kg indicates low toxicity 	LD_{50} greater than 2,500 mg/kg indicates very low toxicity

cent of the group of test animals. For example, if a pesticide has an oral LD_{50} value of 10 mg/kg and the test animals each weigh 1 kg, 50 per cent of the animals would die of poisoning if each ate 10 mg of the pesticide.

The smaller the LD_{50} value, the more toxic the pesticide. The LD_{50} value usually refers to the active ingredient in the pesticide formulation. In this publication, the LD_{50} of the formulated product is also given when available.

Symptoms of Poisoning

Pesticide poisoning can be acute (due to an accident) or chronic (due to continued exposure over a long period). For example, chronic health problems may develop after long term exposure to pesticides low in toxicity. Accidental contact with a pesticide, however, will not necessarily lead to poisoning. Both types of poisoning can exhibit mild, moderate or severe symptoms as follows:

Mild poisoning symptoms: Mild symptoms may be vague and can be compared with a sickness such as influenza. Typical symptoms include nausea, headache, tightness of chest, loss of appetite and stomach cramps. These symptoms can be immediate or be delayed by 12 to 24 hours.

Moderate poisoning symptoms: These symptoms are usually more pronounced than mild symptoms. They include nausea, trembling, lack of muscle co-ordination, excessive saliva, blurring of vision, tightness of chest, difficulty in breathing, flushed or yellow skin, abdominal cramps, vomiting, diarrhea, tearing from eyes, profound weakness, rapid pulse and cough.

Severe poisoning symptoms: Severe symptoms are often more specific and require immediate hospital treatment. They include vomiting, diarrhea, excessive sweating, inability to breathe, convulsions, fever, intense thirst and coma. It is imperative to reduce exposure when using all pesticides whether they are highly toxic or have very low toxicities.

Reducing the Risk of Exposure to Pesticides

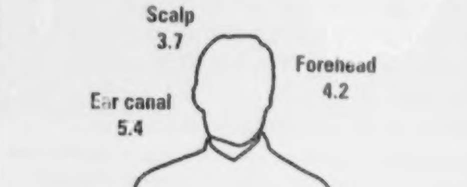
Pesticides may enter the body through the skin (dermally), the mouth (orally) or the nose (inhalation).

Skin

Absorption through the skin is the most common route of exposure. Different areas of the body absorb pesticides at different rates. For example, assuming the forearm is given an absorption rate of 1.0, the relative absorption rate of pesticides in the ear canal is 5.4, on the scalp 3.7, on the forehead 4.2 and the genital area 11.8 – almost 12 times greater than the forearm.

Absorption Rates

Compared to forearm, which is 1.0



The genital area and the head are the areas where absorption is the greatest.

Reducing the risk of exposure through the skin is possible through the careful selection, use and care of protective clothing and safety equipment. Protective clothing and equipment can provide a barrier that reduces contact between the skin and pesticides. See the section on *Protective Clothing and Equipment* for recommended wear. To help reduce pesticide build-up, clothing should be washed daily using recommended procedures; see *Cleaning of Clothes and Equipment* section.

How skin is exposed to pesticides:

- Direct handling of pesticides – this includes any activity where the pesticide could come into direct contact with the skin, from spills and splashes during mixing and handling of the concentrated pesticide, during equipment adjustment and from spray drift during application. The greatest risk occurs when the chemical concentrate is being handled; extra protection should be used at that time. The use of a waterproof apron is highly recommended when handling all pesticide concentrates, regardless of toxicity.
- Transfer from contaminated clothing or equipment – clothing worn during pesticide use should be restricted to that use only, thereby eliminating the possibility of continued dermal exposure due to pesticide residues remaining in the clothing. Some types of concentrated pesticides are not removed after multiple washings. Clothing contaminated by accidental spills of concentrated pesticide should be discarded rather than laundered. Avoid entering the house wearing contaminated clothing and equipment. Pesticides may be transferred from boots to floors and carpets where children and pets may be exposed.
- Transfer to other clothing during washing – always store and wash pesticide-contaminated clothing separately from the rest of the family wash as pesticides can be transferred to other clothing during the laundering process.

Protective Clothing and Equipment

Even pesticides not absorbed by the skin may still cause skin problems such as redness, blisters or dry scaliness, which may lead to serious skin eczema and dermatitis. Good personal hygiene is important to help minimize pesticide absorption through the skin. Shower, shampoo your hair and put on clean clothing immediately after you finish using pesticides for the day or after an accidental spill. Cuts and scrapes should be cleaned and bandages changed after handling pesticide to avoid possible dermal absorption from contaminated bandages.

Eyes

Eyes are very sensitive to pesticides and can be exposed to vapour or fumes, dust, spray drift, or accidental spills and splashes when containers of liquid concentrates are being opened or when the concentrated chemical is being poured into the sprayer tank. Do not wear contact lenses when mixing or applying pesticides.

Ears

Sprays and spills may contaminate the head and ear canal.

Nose

Pesticides can enter the body through breathing in fumes, dusts or spray mists. Fumes and extremely fine particles of dust or spray can be completely absorbed by the lungs. To minimize exposure, respirators always should be worn when opening and mixing all concentrated pesticides. Read the pesticide label and follow the precautions outlined. A respirator may be required when applying pesticides.

Mouth

Pesticides can enter the body through the mouth when users eat, lick their lips or smoke when hands are contaminated. Face and hands should be washed thoroughly prior to eating or smoking. Children may be poisoned if they drink pesticides stored in pop bottles. All pesticides must be stored in their original containers and should be placed in a locked area out of reach of children.

Minimum Protection

A minimum level of protection is required when working with dilute, less toxic or granular pesticides. Where there is a direct contact with the pesticide, add extra protection.

Hard hat
(wide brimmed, no leather liner)

Coveralls
cloth or disposable (wear closed at neck, over long-sleeved shirt and full-length pants)

Gloves
unlined, nitrile or neoprene (cuff gloves and wear sleeves over gloves)

Boots
neoprene overboots or high rubber boots (wear pants outside boots)

Extra Protection

Extra protection is required for mixing, loading and handling pesticide concentrates, especially when working with highly toxic pesticides. Check pesticide label.

Goggles or face shield

Respirator
(check label if needed for less toxic pesticides)

Hooded coveralls
chemically resistant (when mixing, loading or applying very toxic pesticides and when application drenches applicator)

Waterproof apron
(when handling all concentrated pesticides)

Coveralls

Wear coveralls, closed at the neckline and wrists and over full-length pants and long-sleeved shirts, also worn closed at the neckline and wrists.

Minimum protection

- Cloth – if cotton or cotton/polyester coveralls are worn, they should be washed after daily use. Some pesticides are difficult to remove from cloth.
- Disposable, nonwoven – a number of limited use, disposable, nonwoven, hooded coveralls are now on the market; instead of laundering, they are disposed of at an approved landfill and thus, the problem of decontamination is avoided. Not all disposables are suitable for pesticide use, especially for liquid pesticides. Check with your supplier.

  Common disposable brands are Kimberly-Clark KleenGuard LP (Liquid Protection) and DuPont Tyvek. Both disposables provide an extra layer of protection. Check for comfort and size before purchase. Disposable coveralls are more fragile than standard ones and are only expected to last a limited number of wearings.

Extra protection

- DuPont's Tyvek QC (polyethylene coated Tyvek) and Tyvek/Saranex (saran coated Tyvek) provide greater durability and are more repellent to larger pesticide spills. However, they are more expensive and must be specially ordered. These coveralls are uncomfortable when worn for long periods in hot weather because of heat build-up and lack of breathability.
- Impermeable rainwear – two styles are available: coveralls or two-piece suits. They are similar in price to the more expensive disposable coveralls. Generally, they are a P.V.C. (polyvinyl chloride) coating on nylon. Although excellent in liquid repellency, they too can be uncomfortable because they do not breathe and cannot be worn for long periods in hot weather. After use, they should be hosed down and washed with soap and water.

Remember, When Using Disposable Coveralls . . .

- Before purchasing any disposable coveralls, make sure they are recommended by the manufacturer for pesticide use. Avoid wearing all-purpose disposables.
- When removing disposable coveralls, take care not to contaminate the interior if the coveralls are to be worn more than once. Between wearings, hang in a well ventilated area, away from other clothing.
- Do not launder disposables, but do launder all clothing worn under disposables, just as you would other clothing worn during pesticide use.
- Replace with a new coverall when severe pilling (balls of fiber on the surface), rips or holes occur. To discard, place in a plastic garbage bag and take to an approved landfill site; do not burn.

Gloves

Unlined gloves are required when handling, mixing or pouring concentrated pesticides, during field application and when equipment needs adjusting. Never use bare hands to do these jobs. Studies reveal that the greatest exposure is often through the hands. A variety of glove materials may be found on the market. Unlined nitrile and neoprene gloves are suitable for most pesticides. All gloves should be washed soon after the concentrated chemical has been mixed as pesticide may penetrate into the material if it is not cleaned off. Care should be exercised to avoid contaminating the interior of gloves when they are taken off and put on. If possible, wash the outside of the gloved hands prior to glove removal, to avoid contaminating the interior. At the end of the day, both the inside and outside of the glove should be washed.

Prior to use, inspect gloves and replace immediately if cracks, swelling, discolouration, holes or rips develop. Cuff glove and wear sleeves over top of gloves to help prevent spills and splashes of pesticides from running down inside the gloves. Do not continue to wear contaminated gloves and avoid wearing leather, cloth or natural rubber gloves as they soak up the chemical and become a source of continuous contamination.

Boots

Neoprene overboots or long rubber boots are the recommended footwear as they are less likely to absorb pesticides and are more easily cleaned. Be sure to wear the pant leg over the boot to avoid pesticides running down into the boot. In case of such an accident, wash the boots out immediately; otherwise, wash the outside of the boots daily.

Minimum protection

Prevent powders, dusts or spray mists from being deposited on the hair or scalp by wearing a hard hat. The hard hat should be washed daily. Avoid the use of a hard hat with a leather inner band.

Extra protection

Protect hair, scalp, ears and neck from dust, sprays and spill when you are likely to contaminate the head area. Wear a wide brimmed hat that covers the neck or hooded coveralls, with the hood under the hard hat. Only wear ear plugs if required for hearing protection. Use disposable ear plugs made of self-molding foam, and dispose of them after use.

Goggles or face shields

Protect the eyes and face against pesticide vapours, dust and splashes when handling concentrated pesticides. Goggles and face shields must have resistance to chemicals and have ventilation to prevent fogging. Clean after each day of use and store away from direct sunlight.

Avoid Wearing

(These materials absorb chemicals and prolong exposure to the wearer; most are not easily cleaned).

- fabric baseball caps
- cloth or leather gloves, shoes or boots
- natural rubber or plastic gloves (not resistant to pesticides)
- leather belts or watch bands
- contact lenses

Respirators

Purchase a respirator recommended for the pesticides used and make sure it fits properly. A good airtight fit is required over the nose and mouth; beards and moustaches can prevent a close fit.

Respirators have two cartridges attached onto a facepiece. Each cartridge contains a pre-filter that removes dust particles and a filter of activated charcoal that absorbs the chemical. The cartridges should be unscrewed and replaced as soon as any odor of the pesticides is detected in the facepiece. Clean respirators after each day's use; unscrew the cartridges and wash the facepiece with soap and water. Rinse the facepiece in clean water, dry with a clean cloth and screw on the cartridges. The clean respirator should be stored away from direct sunlight in a sealed plastic bag to prevent cartridges from absorbing airborne contaminants. Disposable respirators are also available. Replace as soon as any pesticide odor is detected. Wash after daily use – do not get the charcoal filter wet. Store in a sealed plastic bag. **Note:** Gauze and dust masks are not respirators and are not recommended for pesticide use!

Gas masks

These are used when an applicator is likely to be exposed to very high levels of pesticides (fumigants). The face piece covers the eyes, nose and mouth. It is connected by a flexible hose to a charcoal canister worn on the belt. The lifespan of this canister is longer than that of the respirator cartridges. Manufacturer's directions are to be followed for cleaning and storing gas masks and canisters.

Minimize Exposure

- wear recommended protective clothing and safety equipment
- limit cothing worn for pesticide use to that use only
- wash clothing and equipment daily after use
- replace clothing and equipment that is no longer serviceable

Cleaning of Clothes and Equipment

Skin can absorb chemicals from inadequately cleaned clothing and equipment. Safe removal of pesticide demands special care in handling and washing contaminated clothes.

Handling pesticide soiled clothing

- handle soiled clothing with unlined, nitrile gloves
- remove pesticide granules from cuffs and pockets outdoors
- discard any garment saturated with pesticide concentrate
- temporarily store clothing in disposable plastic bags before washing
- take disposables to approved landfill

Washing pesticide soiled clothing

- wash daily
- wash separately from regular laundry
- pre-treat with a stain removal product if an emulsifiable formulation used, or
- pre-rinse on pre-soak cycle of washer
- avoid overcrowding washer
- use hot water setting
- use full water level and normal cycle
- use extra heavy duty detergent as recommended for heavily soiled loads
- repeat wash procedure
- clean washer after use (run empty washer through full cycle with hot water and detergent)

Drying

- line dry to prevent contamination of dryer and increase the chemical breakdown of pesticide residues

Washing other equipment

- wash other equipment daily in hot soapy water: hard hat, goggles, apron, gloves, boots and respirator (avoid getting charcoal wet; remove if possible)

Specific Cleaning Procedures for Pesticides

The standard washing procedure mentioned above reduces pesticides from contaminated clothing, but new research is gradually identifying more specific washing procedures to further reduce the residues on contaminated clothing or equipment. Note that each product requires unique washing procedures, and more testing is required for those that still have high residues remaining. Refer to the guide below:

Recommendations

1. 18 per cent residue is an unacceptable level. For better protection, choose a disposable coverall and discard after use.
2. Soak contaminated clothing in undiluted limonene for required time. (Examples of this product are Odor Crush or Citra-Solv.).
3. Pre-treat contaminated clothing before washing, let soak.
4. Fill 70 L washing machine with warm water (50°C); add 280 mL of chlorine bleach. Soak for required time. (**Note:** loss of strength and colour results from bleach soak, more so for cotton than for cotton/polyester blends)
   Note: Acceptable levels of residue remaining – less than 3 per cent.

For further information on protective clothing for pesticide use, contact the Alberta Ag-Info Centre at 1-866-882-7677.

Product	Suggested washing procedure	% Residue remaining
2,4-D (Amine)	One wash	<1%
2,4-D (Ester)	1/2 hour Limonene soak (2) (degreaser), one wash	18% (1)
Captan	One wash	1%
Chlorpyrifos (Lorsban, Dursban, Pyrinex)	3 hour bleach soak (4), one wash	<1%
Diazinon	Hot wash (60°C) or Spray'n Wash soak, one wash	1%
Iprodione (Rovral)	One wash	1%
Malathion (diluted)	Two washes	3%
Triallate (Avadex)	Spray'n Wash soak (3), two washes	18% (1)
Any concentrated pesticides	Discard	Too high

Source: *Effective Pesticide Decontamination Procedures for Clothing, Equipment and Spills, Research Project Report*, University of Alberta, Alberta Occupational Health and Safety Heritage Grant Program, 1994.

Other Precautions and Safety Tips

Fresh water supply

Always carry a supply of fresh water to clean up accidental spills and a clean pair of gloves for equipment adjustments.

Remote control devices

Devices (e.g. solenoid valves) can be installed to remotely control the sprayer, preferably from within the tractor cab. These devices can reduce operator exposure to pesticides.

Tractor cab cleanup

After spraying pesticides, the inside of the tractor (seat, steering wheel, etc.) can be decontaminated by wiping with warm soapy water and a sponge.

Tractor cab filters

Charcoal filters are available for fitting onto the tractor air intake system, to filter out pesticides from the air entering the tractor cab. The use of these filters is highly recommended to reduce pesticide exposure during spraying operations. Check with tractor manufacturers to determine which charcoal filter is recommended for your tractor.

Grazing and Haying Restrictions

Traditionally, pesticides have been registered for use on crops grown to maturity. Grazing or cutting of the immature crop for hay has not been considered as the intended use, so residue information on the immature plant has not been requested in the registration process. A grazing or haying interval is considered in the registration process only if the green matter is to be fed to livestock. Consequently, many pesticide labels are currently silent about grazing, i.e. there is no statement on the label as to whether or not it is safe to graze the crop(s) listed on the label prior to maturity. The absence of this information may lead producers to assume that since there is no specific warning with respect to grazing, it is safe to do so.

Present pesticide labelling policy is meant to define only the acceptable uses of the product. It does not list or take into account the "do not's." Therefore, it cannot be assumed that if something is not stated on the label, it is accepted for use. A new accepted use can only be made through the submission of relevant data to support that use.

In light of the above, pesticide labels that are silent on grazing will carry the following statement: "Do not graze the treated crops or cut for hay; there are not sufficient data available to support such use."

Honey bee safety

Bees may be affected by pesticides. Avoid spraying near hives or contaminating puddles of water from which bees may drink. Spray early in the morning or late in the afternoon when bee activity is at a minimum. Warn beekeepers of your intentions, so they can confine the bees or move them until spraying is over.

Farm Safety Program

For further information on farm safety, please contact the Farm Safety Program of Alberta Agriculture, Food and Rural Development at **427-4231** or write to 7000 - 113 Street, Edmonton, Alberta, T6H 5T6.

Safety Equipment and Clothing

Protective clothing and equipment is available from the following:

Local U.F.A. and safety equipment suppliers
Fleck Bros.
1-800-262-9063
Levitt-Safety Limited
1-800-661-3973
Acklands-Grainger Inc.
1-800-661-3950

First Aid

Poison Information Centres (Alberta) 1-800-332-1414 (Calgary only) 944-1414

The emergency department of most hospitals can deal with pesticide poisoning. However, the Poison Centre in Calgary can provide information on recognizing poisoning symptoms and in giving the right treatment. It offers a 24-hour toll free service.

Some manufacturers have emergency telephone numbers to call in case of pesticide poisoning.

BASF Canada
1-800-454-2673

Bayer CropScience
CANUTEC (collect)
1-613-996-6666

Dow AgroSciences Canada Inc.
1-519-339-3711

DuPont Canada Inc.
1-613-348-3616

Gustafson
CANUTEC (collect)
1-613-996-6666

Monsanto Canada Inc.
1-314-694-1000 or 1-800-332-3111

Nufarm Canada
1-202-483-7616 (collect)

Syngenta Crop Protection Canada Inc.
1-800-327-8633

United Agri Products
1-800-561-8273

Standard First Aid Measures

Before using a pesticide, look for the warning symbol on the label. This label indicates the toxicity of the pesticide. If you are severely exposed to a pesticide and you are alone, do not panic. The symptoms of the pesticide do not show up immediately. You will have some time to decontaminate yourself.

If in eyes

Wash eyes with water at once. Hold the eyelids open and wash eyes for at least 15 minutes with fresh water each time. Get help to take you to the emergency department of the nearest hospital and take the labelled container with you. Do not use any eye medication unless prescribed by a doctor.

If on skin

Get any spilled pesticide off your body immediately. If the pesticide is on your clothes, remove them and rinse your skin with water. After rinsing, wash the area with soap and water. Obtain medical attention if area of contact is large or if irritation persists.

If swallowed

Seek medical attention. Do not induce vomiting even though label instructions may say so. Health and Welfare Canada states that inducing vomiting by a non-trained person can be more hazardous to the victim than the chemical itself. Get to the nearest hospital as soon as possible.

Glossary of Terms in Pest Control

Acaricides: Pesticides that kill ticks and mites.

Active ingredient (a.i.): The concentration of chemical in a formulated product responsible for action.

Antagonism: Opposing action of different chemicals such that the sum of their total effect is less than the effect if each pesticide were used alone.

Antidote: A first aid treatment to offset the toxic effect of a pesticide.

Bioassay: Determination of concentration of a pesticide by comparing its effect on a test organism with that of a standard preparation.

Carrier: Liquid or solid used to facilitate application of a pesticide.

Chlorotic: Loss or fading of green colour in foliage.

Contact pesticide: Causes localized injury to plant tissue, or causes an effect when the pesticide hits the pest or the pest contacts the treated surface.

Degradation: Breakdown of a pesticide by action of air, water, sunlight, microbes or other agents.

Desiccant: Chemical use to accelerate drying of plant tissues.

Efficacy: Effectiveness of chemical on the pest.

Established forage: A forage crop that has gone through three months of a growing season.

Foliar application: Made to the leaves of plants, as opposed to soil application.

Formulation: Form in which the manufacturer prepares a pesticide to facilitate its use: granular, solution, emulsifiable concentrate, dry flowable, liquid flowable, wettable powder.

Fumigant: Vapour active chemical used against pests.

Half-life: Time required to break down 50 per cent of a pesticide.

Herbicide group: A collection of herbicides that have the same method of killing the weed.

Incompatibility: Where one pesticide cannot be satisfactorily mixed with another: mixture may gel, lose activity, settle out or be phytotoxic.

Inhibit: Prevent or stop a process, e.g. inhibits photosynthesis.

Mode of action: The specific mechanism through which a pesticide affects a pest.

Necrosis: Localized death of plant tissue, usually characterized by browning and desiccation.

Non-cropland: Land not in crop production or not intended for crop production.

Pesticide group: A number of pesticides that have the same mode of action.

Photosynthesis: Process by which green plants use sunlight, carbon dioxide and water to produce plant food.

Phytotoxic: Injurious to a plant.

Plant growth regulators (PGR): Chemical that affects the normal growth process of plants.

Preharvest interval (PHI): Time (days) between the last application of the pesticide and harvest. Harvest includes cutting (swathing) or grazing; it does not include combining or baling for hay.

Residual herbicide: Persists in soil, kills regrowth and/or germinating seedlings over an extended time.

Resistance: A genetic change in a pest population as a result of selection by a pesticide, which results in a loss of control.

Synergism: Complementary action of different pesticides such that the total effect is greater than the sum of their independent effects.

Systemic pesticide: Able to move in the plant, insect or other organism from the initial point of contact.

Weed control: A minimum of 80 per cent reduction in weed stand and/or growth.

Weed suppression: A minimum of 60 per cent reduction in weed stand and/or growth.

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Chemical Weed Control in Alberta

Chemical weed control functions on the basis that certain chemicals are capable of killing some kinds of plants (weeds) without injury to other kinds (crops). As a group, these chemicals are called herbicides.

Herbicides are effective tools for the control of weeds, and **herbicides demand respect**. When properly used, herbicides can safely and effectively accomplish their objective; misused, they can cause severe economic loss. The misuse of herbicides is usually due to:

- ignorance of their characteristic activity and/or
- carelessness in their application

Misuse includes such factors as applying improper dosages; using the wrong herbicide; failure to properly calibrate application equipment; failure to wash application equipment thoroughly before switching herbicides; improper soil incorporation; timeliness of application, with respect to the growth stage of crop or weed.

This guide lists the major herbicides registered for field crop use in Alberta. Refer to product labels attached to the herbicide containers for final detailed information.

Conservation tillage and herbicides

Conservation tillage is a general term used to describe a cropping program in which some or all of the tillage operations are replaced by using herbicides to control weed growth while, at the same time, preventing soil erosion and conserving soil moisture. The following terminologies are included under conservation tillage: reduced tillage, minimum tillage, no-tillage or zero tillage, direct drilling and chemical fallow.

Herbicides for conservation tillage are listed below. Rates of application, weeds controlled and other pertinent information can be found by referring to each herbicide in this guide.

- **2,4-D or MCPA** – To control winter annuals such as flixweed, shepherd's-purse and stinkweed. Application should be made to emerged weeds prior to freeze-up.
- **Heritage** – Use in the Brown soil zone only during the fallow year.
- **Glyphosate Formulation** – Apply any glyphosate formulation mixed with a non-ionic surfactant (if required) to actively growing weeds. Can be tank mixed with Banvel; 2,4-D Amine; Pardner.
- **Rustler** – Controls annual grasses, broadleaf weeds and volunteer cereals. Can be tank mixed with 2,4-D.

Nitrate poisoning of livestock

Nitrate accumulations may be caused by leaf damage from frost, hail or herbicide action. Symptoms of nitrate poisoning include reduced milk production and growth rate, abortions and in severe cases, death by suffocation. A veterinarian should be called immediately if livestock show unusual symptoms when they are fed forages that may contain nitrates.

After severe frost, hail or herbicide damage, the nutrient value of the crop will decrease rapidly. In terms of nutrition, it is important to harvest as soon as practical; however, in the case of herbicide treated crops, there may be a waiting period specified on the herbicide label. Especially in the case of high risk crops, such as oats or corn, a delay may be advisable to permit nitrate levels to decrease. If there is a possibility of high nitrates in feed, have the feed analysed at a feed testing laboratory.

Weed control in forage crops

Make sure all forages, as well as any companion crops, present in the stand are listed for the intended use on the herbicide label. Follow the label directions on the herbicide container closely, especially for stage of crop and weed development, water volume, grazing and feeding restrictions.

Herbicide performance ratings

Herbicide performance ratings (numbers in brackets after the names of crops or weeds) are based on data from the Expert Committee on Weeds (Western Section) Research Reports. These numbers are not absolute and, therefore, not a guarantee of expected performance. They are meant to be used as as guide when selecting a herbicide. When a number is not included, there is not sufficient data to provide a rating.

Tolerance of crop to herbicides

The number appearing in brackets following the crop on which each herbicide is registered represents the expected tolerance of the crop to that herbicide. Due to variations in variety, weather, timing and application techniques, this number is only approximate. 0 = complete kill of the crop and 9 = no measurable injury to the crop.

Level of weed control with each herbicide

The number appearing in brackets after each weed represents the average level of weed control expected with the herbicide. Due to variation in weather, growth stage, time of day, application technique, etc., this number is only approximate. 0 = no control of the weed and 9.0 = complete kill of the weed. A weed control rating of 7.0 or greater is considered commercially acceptable.

Water Used for Spray Application

The quality of water used can affect the efficacy of some herbicides. Water quality includes the cleanliness (silt, organic matter and soil), the hardness or softness of the water and the water pH.

Some herbicides, including Roundup/Touchdown, adsorb to silt and become inactivated. This causes a decrease in herbicidal activity. Silty water is usually a problem where surface water is being used.

Other herbicides, including 2,4-D Amine and several Group 1 herbicides have reduced efficacy when applied in mineralized water. Minerals include both calcium and magnesium sulfates, which result in 'hard' water, and excessive sodium bicarbonate, which results in 'soft' water. Mineralized water is most commonly a problem when well-water is used. When efficacy decreases, it is most apparent on hard to control weeds and is easily confused with late application, poor growing conditions or reduced herbicides rates.

The pH of water or water temperature can affect the ability of some herbicides to stay dissolved in the spray solution. To avoid these problems, the manufacturer will suggest a specific order to add surfactant or mixtures of products. For example, to mix the herbicide Horizon, the herbicide is added first, followed by the surfactant, Score, and all mixing is done under agitation. Follow label recommendations for mixing. Products cannot work unless they are dissolved or miscible (capable of being mixed) in the water. Also, if products are not in solution they can form a sludge in the spray tank and block nozzles.

It is best to avoid using poor quality water if possible; however, the following remedies can limit the loss of herbicidal activity.

Herbicide Resistance

Herbicide resistance is an issue of increasing concern in Alberta. Since the first documented case of chickweed resistance in the mid 1980's, the number of herbicide resistant weeds and the area infested by them continue to increase. At present in Alberta, more than 10 weed biotypes are resistant to chemicals from six herbicide groups. In addition,

Herbicide and Water Quality

Herbicide	Quality concern	Remedy
2,4-D Amine*	Mineralized water	Use a non-ionic surfactant like Agral 90
Achieve (tralkoxydim)	Mineralized water	Add ammonium sulfate (1% v/v)
Poast (sethoxydim)	Mineralized water	Add ammonium sulfate (1% v/v)
Roundup/Touchdown	Mineralized water	Add ammonium sulfate fertilizer 3 kg/100 L application solution
Roundup/Touchdown	Silty or dirty water	Filter water or use clean water
Select (clethodim)	Mineralized water	Add ammonium sulfate (1% v/v)

* **Note:** 2,4-D Ester formulation is not affected.
Information primarily derived from F. A. Holm, J. L. Henry, D. W. Gruber and P. McMullan, 1995 Water quality effects on phenoxy and ACCase inhibiting herbicides. Proceedings of the Weed Research/Symposium, University of Alberta.

some of these resistant weeds are resistant to more than one herbicide group (see table below). It is essential that producers be able to identify these resistant weeds and take action to minimize or prevent the development of resistance on their farms.

How to identify herbicide resistance

Investigate all areas of the sprayed field where weed control did not occur. Rule out other factors that might have affected herbicide performance including mis-application, spray misses, unfavorable weather conditions, herbicide application at an improper leaf stage and weed flushes after application. If resistance remains a likely possibility, check for the following:

- Are other weeds listed on the product label controlled satisfactorily?
- Is herbicide failure patchy with no reasonable explanation?
- Did the same herbicide or herbicide group fail in this area of the field in the previous year?
- Do weeds show herbicide injury symptoms such as root pruning by a Group 3 herbicide or yellow/purple coloration caused by Group 2 applications. Resistant weed biotypes will not show these typical injury symptoms.
- Do field histories indicate extensive use of the same herbicide (or herbicide group) year after year?

How to minimize the development of resistance

Follow the guidelines below to delay the appearance of resistance:

- **Integrated pest management practices** – use herbicides as part of an integrated control program that includes scouting, historical information related to herbicide use and crop rotation, and consider mechanical, cultural, biological and other control practices.
- **Herbicide and crop rotations** – herbicides must be rotated. It is important not only to use a different herbicide, but to use one from a different herbicide group with a different mode of action.
- **Field history** – records are needed to make sensible decisions on herbicide rotation and to evaluate the probability of resistance developing. A pesticide application record sheet can be found at the back of this book.
- **Tank mixture** – a tank mix may delay the appearance of resistant weeds if the components of the tank mixture control the same weed by a different mode of action.
- **Monitor results** – Monitor treated weed populations for resistance development.
- **Preventive measures** – prevent the movement of resistant weed seeds to other fields by cleaning harvesting and tillage equipment as well as planting clean seed.

If resistance is suspected, contact your local extension office, weed specialist or the appropriate chemical company to follow up on the problem.

Herbicide Resistant Weeds in Alberta

Herbicide group	Weeds
Group 1	Green foxtail, wild oats
Group 2	Ball mustard, chickweed, cleavers, hemp-nettle, kochia, Russian thistle, spiny annual sow-thistle, stinkweed, wild mustard, wild oats
Group 3	Green foxtail
Group 4	Hemp-nettle
Group 8	Wild oats
Group 1 + 2 + 25 (multiple resistance)	Wild oats
Group 1 + 2 + 8 + 25 (multiple resistance)	Wild oats
Group 1 + 3 (multiple resistance)	Green foxtail
Group 2 + 4 (multiple resistance)	Cleavers

Herbicide Group Classification by Mode of Action

Mode of action	Chemical family	Active ingredients	Found in*
Group 1			
Inhibitors of acetyl CoA carboxylase ACCase. These chemicals block an enzyme called ACCase. This enzyme helps the formation of lipids in the roots of grass plants. Without lipids, susceptible weeds die.	Aryloxyphenoxy propionate (Fop)	clodinafop propargyl	Harmony Total, Horizon, Horizon BTM
		diclofop methyl	Hoe-Grass 284, Hoe-Grass II
		fenoxaprop-p-ethyl	Champion Extra, Champion Plus, Fusion, Puma^{120} Super, Triumph Plus
		fluazifop-p-butyl	Fusion, Venture L
		quizalofop-p-ethyl	Assure II, Freedom Gold, Muster Gold II
	Cyclohexanediones (Dim)	clethodim	Centurion, Select
		sethoxydim	Elite, FlaxMax, Poast Ultra, Pursuit Ultra
		tralkoxydim	Achieve Liquid, Achieve Liquid Gold, Prevail
Group 2			
ALS/AHAS inhibitors. These chemicals block the normal function of an enzyme called acetolactate (ALS) actohydroxy acid (AHAS). This enzyme is essential in amino acid (protein) synthesis. Without proteins, plants starve to death.	Imidazolinones	AC 299,263 120 AS	Adrenalin
		imazamethabenz	Assert 300
		imazamox + imazethapyr	Absolute, Odyssey
		imazapyr	Arsenal
		imazethapyr	Pursuit, Pursuit Ultra
	Sulfonylamino-carbonyltriazolinones	flucarbazone sodium	Everest, K2
	Sulfonylureas	chlorsulfuron	Telar
		ethametsulfuron methyl	Muster, Muster Gold II
		florasulam	Frontline, Frontline 2,4-D, PrePass, Spectrum
		metsulfuron methyl	Ally Toss-N-Go, Escort
		nicosulfuron	Accent
		rimsulfuron	Prism
		sulfosulfuron	Sundance
		thifensulfuron methyl	Champion Extra, Champion Plus, Freedom Gold, Harmony Total, K2 Refine Extra, Triumph Plus
		triasulfuron	Unity
		tribenuron methyl	Champion Extra, Crossfire, Express Pack, Express Toss-N-Go, Harmony Total K2, Refine Extra
		triflusulfuron methyl	UpBeet
Group 3			
Microtubule assembly inhibitors. These chemicals inhibit the cell division in roots.	Dinitroanilines	ethalfluralin	Edge
		trifluralin	Advance 10G, Bonanza, Fortress, Heritage 5G, Rival, Treflan

(continued)

Herbicide Group Classification by Mode of Action

Mode of action	Chemical family	Active ingredient	Found in*
Group 4			
Synthetic auxins. These chemicals disrupt plant cell growth in the newly forming stems and leaves; they affect protein synthesis and normal cell division, leading to malformed growth and tumors.	Benzoic acids	dicamba	Banvel II, DyVel, DyVel DS, Rustler, Sword, Target, Vanquish
	Carboxylic acids	clopyralid	Absolute, Curtail M, Eclipse, Lontrel, FlaxMax, Prestige, Prevail, Spectrum, Transline
		fluroxypyr	Attain, Prestige, Trophy
		picloram	Grazon, Tordon 22K, Tordon 101 Mixture
		triclopyr	Garlon 4, Remedy
	Phenoxy	2,4-D	2,4-D, Adrenalin, Attain, Calmix Pellets, Champion Plus, Desormone, Dichlorprop-D, Diphenoprop 700, Diphenoprop BK700, DyVel DS, Estaprop, Frontline 2,4-D, Grazon, Interprop, SEE Diphenoprop, Thumper, Tordon 101 Mixture, Turboprop 600
		dichlorprop (2,4-DP)	Desormone, Dichlorprop-D, Diphenoprop 700, Diphenoprop BK700, Estaprop, Interprop, SEE Diphenoprop, Turboprop 600
		2,4-DB	2,4-DB, Caliber 400, Cobutox 600, Embutox 625
		MCPA	Achieve Liquid Gold, Badge, Buctril M, Champion Plus, Clovitox Plus, Curtail M, DyVel, Elite, FlaxMax, Frontline, Horizon BTM, MCPA, Mextrol, Pea Pack, Prestige, Prevail, Spectrum, Sword, Target, Topside, Triumph Plus, Trophy, Tropotox Plus
		MCPB	Clovitox Plus, Topside, Tropotox Plus
		mecoprop (MCPP)	Compitox, DyVel DS, Mecoprop, Sword, Target
Group 5			
Photosynthetic inhibitors at Photosystem II, Site A. These chemicals interfere with photosynthesis and disrupt plant growth, ultimately leading to death.	Phenyl carbamates	desmedipham	Betamix
		phenmedipham	Betamix
	Triazines	atrazine	Atrazine, Laddok, Primextra II Magnum
		simazine	Princep Nine-T
	Triazinones	hexazinone	Velpar DF, Velpar L
		metribuzin	Crossfire, Pea Pack, Sencor
		pyrazon	Pyramin
	Uracils	bromacil	Calmix Pellets, Hyvar X/X-L, Krovar I

(continued)

Herbicide Group Classification by Mode of Action

Mode of action	Chemical family	Active ingredients	Found in*
Group 6			
Photosynthetic inhibitors at Photosystem II, Site II.	Benzthiadiazoles	bentazon	Basagran, Basagran Forte, Laddok
	Nitriles	bromoxynil	Achieve Liquid Gold, Badge, Buctril M, Elite, Hoe-Grass II, Horizon BTM, Koril Mextrol, Pardner, Thumper, Unity
Group 7			
Photosynthetic inhibitors at Photosystem II, Site B.	Amides	propanil	Stampede EDF
	Ureas	diuron	Divrex 80W, Karmex DF, Krovar I
		linuron	Linuron 480, Lorox
Group 8			
Lipid synthesis inhibitors (not ACCase inhibition). These chemicals inhibit the cell division and elongation in the seedling shoots before they emerge above ground.	Thiocarbamates	EPTC	Eptam, Eradicane 8-E
		triallate	Avadex BW, Fortess, MicroActiv
	Unknown	difenzoquat	Avenge 200-C
Group 9			
Inhibitors of EPSP synthesis. These chemicals inhibit the amino-acid synthesis.	None	glyphosate	Credit, Eclipse, Factor, Glyfos, Maverick, PrePass, Renegade, Roundup Dry, Roundup Original, Roundup Transorb, Roundup Weather Max, Rustler, Touchdown iQ, Vantage, Vantage Plus
Group 10			
Inhibitors of glutamine synthetase.	None	glufosinate ammonium	Liberty 150 SN
Group 11			
These chemicals inhibit the carotenoids biosynthesis.	Triazole	amitrole	Amitrol 240
Group 15			
Inhibitors of cell growth and division.	Chloroacetamides	metolachlor	Dual II Magnum, Primextra II Magnum
		propyzamide	Kerb 50W
Group 22			
Cell membrane disrupters. Chemicals that disrupt the internal cell membrane and prevent the cells from manufacturing food.	Bipyridyliums	diquat	Gramoxone PDQ, Reglone Desiccant, Reward
		paraquat	Gramoxone, Gramoxone PDQ

* A herbicide may appear in more than one group if it contains more than one active ingredient.

Absolute *(imazamox + imazethapyr + clopyralid)*

Groups 2,4

Manufacturer: **BASF Canada**

1. **Formulations:** Odyssey: Water dispersible granule 70% (imazamox 35% + imazethapyr 35%), 4 x 86.5 g bags per jug, 2 jugs per case, water soluble bags; Lontrel: Liquid 360 g/L (clopyralid), 2 x 3.4 L jugs; Merge: 1 x 8.1 L jug.
2. **Registered Mixes:** None.

   Surfactants: Merge.

   Mixing instructions: Use a 50 mesh (or coarser) filter screen. Fill sprayer tank with 3/4 the amount of clean water, start agitation and continue throughout the entire mixing and spraying procedure. Add the required amount of Odyssey directly into the sprayer tank opening. Agitate for at least 10 minutes to dissolve herbicide. Add the required amount of Merge. Continue filling and add Lontrel. Finish filling the tank to the desired level with water.
3. **Crops:** CLEARFIELD canola.
4. **Weeds Controlled:**

   alsike clover
   barnyard grass
   Canada thistle
   chickweed
   cleavers
   common groundsel
   flixweed
   green foxtail
   hemp-nettle
   perennial sow thistle
   Persian darnel
   redroot pigweed
   Russian thistle
   scentless chamomile
   shepherd's purse
   smartweed
   stinkweed
   stork's bill
   tufted vetch
   volunteer alfalfa
   volunteer barley
   volunteer canola (non-CLEARFIELD varieties)
   volunteer mustard
   volunteer oats
   volunteer wheat
   wild buckwheat
   wild mustard
   wild oats
5. **Weeds Suppressed:** Kochia, lamb's quarters.
6. **When Used:**

   Crop stage: CLEARFIELD Canola: All soil zones, 2 - 6 leaf stage.

   Weed stage:

   Grassy weeds: 1 - 4 true leaf stage up to early tillering.

   Broadleaf weeds: Cotyledon to the 4 leaf stage. Canada thistle: rosette to pre-bud stage.
7. **How to Apply:**

   With: Ground equipment only.

   Rate: Odyssey: 17 g/ac. Lontrel: 170 mL/ac. Merge: 0.5% v/v (e.g. 5 L/1,000 L spray solution).

   Water volume: 40 L/ac.

   Pressure: 275 kPa.

   Nozzles: 50 mesh screens (or coarser). Flat fan recommended, tilted 45 degrees forward for better penetration.
8. **Application Tips:** Water-soluble bags of Odyssey will dissolve better when kept intact; do not split bags. If agitation is stopped for more than 5 minutes, resuspend spray solution by full agitation prior to commencing spraying again. Do not spray if freezing temperatures are forecast. Treat CLEARFIELD canola during warm weather when weeds are actively growing and soil moisture is adequate for rapid growth. Under cool or dry conditions, control of Canada thistle may be severely reduced. Sow-thistle plants emerging after spraying will not be controlled.

Absolute (cont'd)

9. **How it Works:** Odyssey is absorbed by foliage and roots and disrupts plant metabolism, causing growth to stop. Lontrel is a systemic hormone-type herbicide. It is absorbed by leaves and stem surfaces and is readily translocated. Maximum efficacy results from foliar applications to young, actively growing plants.
10. **Expected Results:** Odyssey: Susceptible weeds may stop growing within 24 - 48 hours. Yellow striping and purplish or reddish discolouration of the leaves may occur. Leaves begin to die in 3 - 10 days, starting with the youngest and moving to the older leaves. Death of the plant may occur in 1 - 3 weeks. Lontrel symptoms on affected plants include swollen growing points and roots, cupping of leaves, twisted and distorted stem. Plants will gradually stop growing and will change colour, first to dark green and then to yellow before turing brown as they die. Maximum effectiveness results from foliar application to young, actively growing plants. Death of weeds may not occur until 14 - 21 days after application. On Canada thistle, some re-growth may occur by the end of the season, but this will not interfere with harvesting of the crop.
11. **Effects of Rainfall:** A rain-free period of 4 - 6 hours is recommended.
12. **Movement in Soil:** The Odyssey components are not leached appreciably. Lontrel is somewhat soluble in water and is somewhat mobile in soil.
13. **Cropping Restrictions:**

    Drift: Small amount of drift may damage sensitive plants such as legumes.

    Minimum interval to harvest: 60 days.

    Succeeding crops: Barley, CLEARFIELD canola, canary seed, durum wheat, oats and spring wheat can be grown safely the year following an application. Flax, lentils, peas and non-CLEARFIELD canola can be grown in the second year after an Absolute application (e.g. if Absolute was applied in 2002 then non-CLEARFIELD canola can be planted in 2004). For other crops call BASF at 1-877-371-2273. Conduct a field bioassay (a test strip grown to maturity) the year before growing any crops other than those listed above. In case of crop failure, replant to CLEARFIELD canola only.

    Grazing restrictions: Do not graze treated crops or cut for hay; there are insufficient data to support such use. Apply Absolute only once per year.
14. **Toxicity:** Odyssey: low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg. Not toxic to birds, fish or beneficial insects such as bees. Lontrel: very low acute mammalian toxicity.
    Acute oral LC_{50} (rats) = >2,000 mg/kg. Acute oral LD_{50} (bees) 100 µg/bees. Extremely low toxicity to fish.
15. **Precautions, First Aid: Flammable**. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. If **swallowed**, seek medical attention.
16. **Storage:** Odyssey: store at temperatures above 5°C, Keep unused water soluble bags in resealed, original containers. Keep package dry at all times. Lontrel: store away from food, feed stuff, fertilizer and pesticides. Store in a heated storage, away from open flames or sparks. If frozen, warm slowly to room temperature and mix thoroughly before use.
17. **Resistance Management:** Absolute is both a Group 2 and a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Absolute and other Group 2 and 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Accent *(nicosulfuron)*

Group 2

Manufacturer: **DuPont Canada Inc.**

1. **Formulations:** Dry flowable 75%; Toss-N-Go 133.6 g (4 x 33.4 g) water soluble pouches.
2. **Registered Mixes:** None.

   Surfactants: Agral 90, Ag-Surf, Citowett Plus.

   Mixing instructions:

   1. Fill clean tank 1/4 full with clean water.
   2. Turn on full agitation.
   3. Add the proper amount of Accent to the water in the spray tank with the agitator running. Maintain full agitation until water soluble bags are completely dissolved and product is fully dispersed. Continuous agitation is required to keep the product in suspension.
   4. After Accent has been well mixed and is in suspension, add a recommended non-ionic surfactant.
   5. Add the remainder of the water.

   On repeat tank loads, ensure that the amount of spray solution left in the tank from the previous load is less than 10% of the volume to be mixed.
3. **Crops:** Field corn.
4. **Weeds Controlled:**

   barnyard grass
   fall panicum
   green foxtail
   old witchgrass
   quackgrass
   wild oats
5. **Weeds Suppressed:** Yellow foxtail.
6. **When Used:**

   Crop stage: Apply when the corn is between 1 - 8 leaf stage (6 visible collars). The coleoptile (short, blunt leaf) is counted as the first leaf.

   Weed stage: Wild oats: 3 - 6 leaf stage. Barnyard grass, fall panicum, green foxtail, old witch grass, yellow foxtail: 1 - 6 leaves (maximum 2 tillers). Quackgrass: 3 - 6 leaves (10 - 20 cm in height, leaf ear extended).
7. **How to Apply:**

   With: Ground equipment. Do not apply by air.

   Rate: 13.5 g/ac.

   Surfactant: 2 L/1,000 L of spray solution.

   Water volume: 40 L/ac (minimum).

   Pressure: 175 - 275 kPa.

   Nozzles: Flat fan types. 50 mesh screens or larger.

   Sprayer cleanup: To avoid subsequent injury to desirable crops, thoroughly clean all mixing and spray equipment immediately after spraying as follows:

   1. Drain tank, thoroughly hose down the interior surfaces of the tank, then flush tank, boom and hoses with clean water for a minimum of 5 minutes.
   2. Fill the tank with clean water while adding 1 litre of household ammonia (containing a minimum of 3% ammonia) for every 100 litres of water. Flush the hoses, boom and nozzles with the cleaning solution and then add more water to completely fill the tank. Circulate the cleaning solution through the tank and hoses for at least 15 minutes. Again flush the hoses, boom and nozzles with the cleaning solution and then drain the tank.

Accent (cont'd)

3. Remove the nozzles and screens, and clean separately in a bucket containing cleaning agent and water.
4. Repeat step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing the water through the hoses and boom.
6. **Prior** to using the sprayer for the next application, flush the tank, boom and hoses for 5 minutes with fresh water.

8. **Application Tips:** **Do not** tank mix Accent with any organophosphate insecticide. **Do not** apply a foliar organophosphate insecticide within 7 days before or after applying Accent. When corn is injured by frost, wait 48 - 72 hours before applying Accent. Stress conditions after application may also result in injury or poor weed control.
9. **How it Works:** Accent is a systemic herbicide that is absorbed by the foliage and translocated to the growing points of the plant. Growth of susceptible plants stops shortly after application. Accent rapidly stops the growth of susceptible species; typical symptoms usually appear within 5 - 7 days, but may not be noticeable for 2 - 3 weeks after application, depending on the prevailing growing conditions.
10. **Expected Results:** Typical injury symptoms include yellowing, purpling and reddening of the newest leaves and usually appear within 5 - 7 days, but may not be noticeable for 2 - 3 weeks after application, depending upon the prevailing growing conditions. Eventually the entire plant discolours and dies. Poor weed control or crop injury may result from applications made to plants under stress from abnormally hot or cold weather; environmental conditions such as drought, water-saturated soils, hail damage or frost; disease, insect or nematode injury; prior herbicide or carryover from a previous year's herbicide application.
11. **Effects of Rainfall:** Rainfall within 2 - 4 hours after application may reduce weed control.
12. **Movement in Soil:** None.
13. **Cropping Restrictions:** Corn and spring cereals (including wheat and barley) crops may be planted the year following Accent application. For all other crops including sugarbeets, a field bioassay is recommended before planting. Do not plant sugarbeet until a field bioassay indicates it is safe to do so.

    Grazing restrictions: Do not graze the treated crops or cut for hay.

    Pre-harvest interval: Do not apply with 30 days of harvest.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a dry place. Keep water soluble bags away from moisture.
17. **Resistance Management:** Accent is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Accent and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 42)*.

Achieve Liquid *(tralkoxydim)*

Group 1

Manufacturer: **Syngenta Crop Protection Canada Inc.**

CAUTION POISON

1. **Formulations:**

   Achieve Liquid: 400 g/L, 1 x 8 L jug, 8 L Turbocharge, 1.6 L SC conditioner.

2. **Registered Mixes:** Attain, Buctril M, Buctril M + Decis, Buctril M + MCPA Ester, Calibre, Combutox, Curtail M, Diclorprop + 2,4-D (Estaprop, Diphenoprop 600, SEE Diphenoprop, Turboprop), 2,4-DB, 2,4-D Ester, Embutox, Lontrel + MCPA Ester, MCPA Ester, Matador, Pardner, Partner + Decis, Prestige, Thumper.

   Mixing restrictions: Not compatible with sulfonylureas (group 2 products) and amine formulations of 2,4-D or MCPA. Tank mixing with unregistered tank mixes may lead to poor weed control and/or unacceptable crop injury.

   Mixing instructions: Recommended mixing order: Achieve Liquid, followed by tank mix partner. Always add Turbocharge adjuvant last.

3. **Crops:** Barley (all 2 and 6 row varieties)(8.9), fall rye, spring rye, spring wheat (all varieties, including durum)(8.9), timothy (grown for hay or seed production), triticale, winter wheat (8.9).
   Cereal crops underseeded to forage legumes (alfalfa, bird's-foot trefoil, clover, sainfoin).

   Underseeding: Alfalfa, bird's-foot trefoil, clovers, sainfoin; when not tank mixed with a broadleaf herbicide. Do not feed or graze forage crops in year of treatment.

4. **Weeds Controlled:** Barnyard grass (8.0), green foxtail (8.3), Persian darnel (8.0), yellow foxtail, volunteer oats (8.3), wild oats (8.3).

5. **Weeds Suppressed:** None.

6. **When Used:**

   Crop stage: Barley (all 2 and 6 row barley varieties), fall rye, spring wheat (including durum), winter wheat, triticale, forage grasses (except Timothy) and legumes (listed above): no restriction in terms of leaf staging.

   Weed stage: Barnyard grass: 1 - 4 leaf stage. Persian darnel: 1 - 4 leaf stage, (Zadoks growth stage of 11 - 14). Green and yellow foxtail: 1 - 5 leaf stage (up to emergence of second tiller), Zadoks growth stage of 11, 20 - 14, 21. Wild oats and volunteer oats: 1 - 6 leaf stage of growth (up to emergence of third tiller), Zadoks growth stage of 11, 20 - 14, 21.

7. **How to Apply:**

   With: Ground and aerial equipment.

   Aerial equipment: Do not apply if the wind is more than 13 km/h. This approach will avoid spray drift onto non-target areas. **Do not apply within 50 m of non-crop areas**, which includes fish-bearing waters, wetlands (potholes, sloughs, etc.) and wildlife habitat (hedgerows, rights-of-way, etc.). **Do not** spray Achieve if tame oats are present in adjacent, downwind fields.

   Nozzles: Flat fan type. 50 mesh or larger screens.

   Pressure: 275 kPa (ground), 140 - 275 kPa (aerial).

   Rate: 200 mL/ac.

   Surfactant: 0.5% v/v or 1 L/200 L of spray solution.

   Water volume: Ground: 20 - 40 L/ac. Air: 12 - 18 L/ac.

   Hard water: Always add ammonium sulfate first at 0.75 - 1.5 kg/100 L (7.5 - 15 lb/100 gallons) of water when water analysis indicates bicarbonate (BCO_3) ion levels are 400 ppm or greater.

Achieve Liquid (cont'd)

Mixing instructions:

1. Add Achieve Liquid herbicide to the spray tank. Only use sprayers in good running condition with high agitation. Ensure the sprayer and pre-mix tank is cleaned according to instructions on label of the product used prior to Achieve Liquid herbicide. Use only clean water for the spray solution. Ensure that all in-line strainer and nozzle screens in the sprayer are 50 mesh or coarser.
2. Begin to fill sprayer tank or pre-mix tank with clean water, and engage agitator. Agitation must be continued throughout the entire mixing and spraying procedure.
3. When the sprayer or pre-mix tank is three quarters full of water, add SC conditioner with ammonium sulfate first and then Achieve Liquid. If more than 1 case of Achieve Liquid is to be used, add the Achieve Liquid from all cases prior to adding tank mixed products or Turbocharge.
4. If tank mixing, add the recommended product(s) next.
5. Lastly, add Turbocharge, and then continue to fill tank to desired level with water.

8. Application Tips:

Weed control: Optimum weed control is obtained by applying herbicides when targeted weeds are actively growing. Applying herbicides under stressful conditions (drought, heat, frost, poor soil fertility, flooding or prolonged cool temperature) may delay or reduce weed control.

Crop safety: Applications of Achieve Liquid to non-tillered crops exposed to 4°C temperatures before or after spraying should be avoided to prevent the possibility of crop injury. Tillered cereal crops may incur injury if Achieve Liquid is sprayed within 48 hours of freezing temperatures.

Sequential applications: Always apply Achieve Liquid first and allow 5 - 7 days before applying any other non-registered tank mix herbicide. This is especially critical for sulfonylureas (group 2 products).

9. How it Works: Achieve Liquid is a systemic herbicide that is absorbed through the leaves and translocated to the growing points within the plant where it inhibits an enzyme involved in lipid biosynthesis. Thorough coverage of the foliage is important for consistent grass control.

10. Expected Results: Grass growth stops in 48 hours. Young shoots turn brown in 7 - 8 days. Complete death of plant will take 2 - 3 weeks

11. Effects of Rainfall: No effect 1 hour after application.

12. Movement in Soil: No soil movement. This product will not leach in the soil.

13. Cropping Restrictions:

Succeeding crops: No restrictions.

Grazing restrictions: Immature cereal crops may be grazed, harvested or cut for hay 16 days after treatment. Mature straw may be fed to livestock. Do not feed or graze underseeded forage crops in the year of treatment.

Other restrictions: Pre-harvest interval is 60 days.

14. Toxicity: Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.

15. Precautions, First Aid: Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before use.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. Storage: Store in a cool, dry place. Keep packages dry at all times. Product is not affected by freezing.

17. Resistance Management: Achieve Liquid is a Group 1 herbicide. Any weed population may contain or develop plants naturally resistant to Achieve Liquid and other Group 1 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Achieve Liquid Gold

(tralkoxydim + bromoxynil + MCPA)

Group 1,6,4

Manufacturer: **Syngenta Crop Protection Canada Inc.**

WARNING POISON

1. **Formulations:**
   1. Achieve Liquid: suspension concentrate 400 g/L; 1 x 4 L.
   2. Buctril M: emulsifiable concentrate 280 g/L bromoxynil + 280 g/L MCPA; 1 x 8 L.
   3. Turbocharge: 1 x 4 L jug.
2. **Registered Mixes:** Achieve Liquid: MCPA Ester, Decis.

   Mixing instructions: Recommended mixing order: Add ammonium sulfate first before Achieve Liquid, followed by Buctril M and tank mix. Always add Turbocharge adjuvant last.
3. **Crops:** Barley (all 2 and 6 row varieties)(8.9), fall rye, spring rye, spring wheat (all varieties, including durum)(8.9), winter wheat (8.9).
4. **Weeds Controlled:**

   American nightshade
   ball mustard
   barnyard grass (8.0)
   bluebur
   cocklebur
   common buckwheat
   common groundsel
   common ragweed
   cow cockle (7.8)
   flixweed (5.7)
   green foxtail (8.3)
   green smartweed
   kochia (6.7)
   lady's-thumb
   lamb's-quarters (8.6)
   night-flowering catchfly (7.8)
   pale smartweed (8.2)
   Persian darnel (8.0)
   redroot pigweed (7.9)
   Russian thistle (7.1)
   scentless chamomile (7.2)
   shepherd's-purse (6.0)
   stinkweed (8.9)
   tartary buckwheat (8.5)
   volunteer oats
   volunteer rapeseed (8.7)
   volunteer sunflower
   wild buckwheat (8.1)
   wild mustard (8.4)
   wild oats (8.3)
   wild tomato
   wormseed mustard
   yellow foxtail
5. **Weeds Suppressed:** Canada thistle (4.9), perennial sow-thistle.
6. **When Used:**

   Crop stage: Barley (all 2 and 6 row barley varieties), fall rye, spring wheat (including durum), winter wheat: 2 leaf to early flag leaf.

   Weed stage: Barnyard grass: 1 - 4 leaf stage. Persian darnel: 1 - 4 leaf stage, (Zadoks growth stage of 11 - 14). Green foxtail: 1 - 5 leaf stage (up to emergence of second tiller), Zadoks growth stage of 11, 20 - 14, 21. Wild oats: 1 - 6 leaf stage of growth (up to emergence of third tiller).

   Broadleaf weeds: Up to 4 leaf stage: American nightshade, ball mustard, bluebur, cocklebur, cow cockle[1], flixweed, green smartweed, kochia[2], lady's thumb, night-flowering catchfly redroot pigweed, pale smartweed, Russian thistle[2], scentless chamomile[3], shepherd's-purse, volunteer canola, volunteer sunflower. **Up to 6 leaf stage:** Wild tomato. **Up to 8 leaf stage:** Common buckwheat, common groundsel, common ragweed, lamb's-quarters, stinkweed, tartary buckwheat, wild buckwheat, wild mustard, wormseed mustard.

[1] In normal conditions, cow cockle will be controlled up to the 4 leaf stage. Plants beyond this stage are unlikely to be controlled.

[2] Spray before plants are 5 cm high.

[3] Spring annuals only.

Achieve Liquid Gold (cont'd)

7. How to Apply:

With: Ground and aerial equipment.

Aerial equipment: Do not apply or Achieve Liquid Gold if the wind is more than 13 km/h. This approach will avoid spray drift onto non-target areas. **Do not apply within 50 m of non-crop areas**, which includes fish-bearing waters, wetlands (potholes, sloughs, etc.) and wildlife habitat (hedgerows, rights-of-way, etc.). **Do not** spray Achieve Liquid Gold if tame oats are present in adjacent, downwind fields.

Ground equipment: Nozzle may be angled at 45° to enhance penetration of Achieve into crop canopy and provide better coverage. **Do not apply within 15 m of non-crop areas**.

Nozzles: Flat fan type. 50 mesh or larger screens.

Pressure: 275 kPa (ground), 137 - 275 kPa (aerial).

Rate:

	Water volume	Rate		Adjuvant rate
Product	**(L/ac)**	**Achieve**	**Buctril M**	**Turbocharge**
Achieve Liquid Gold	20 - 40 (ground) 12 - 18 (air)	200 mL/ac	400 mL/ac	0.50% v/v or 1 L/200 L

Hard water: Add ammonium sulfate at 0.75 - 1.5 kg/100 L (7.5 - 15 lb/100 gallons) of water when water analysis indicates bicarbonate (BCO_3) ion levels are 400 ppm or greater.

Mixing instructions:

1. Use Achieve Liquid Gold in previously cleaned sprayers with good agitation. Agitation should be used throughout mixing.
2. Fill sprayer tank with 3/4 of the required volume of clean water. **If water has bicarbonate ion levels of 400 ppm or greater add ammonium sulfate at a rate of 0.9 - 1.8 kg per 100 L of water**.
3. Add the Achieve Liquid required to the spray solution.
4. Add the Buctril M followed by the tank mix partner (if desired).
5. Add the Turbocharge adjuvant, and complete filling the sprayer tank with water to the desired final water volume.

Note: Achieve Liquid Gold must be sprayed within the same day of mixing.

8. Application Tips:

Weed control: Optimum weed control is obtained by applying herbicides when targeted weeds are actively growing. Applying herbicides under stressful conditions (drought, heat, frost, poor soil fertility, flooding or prolonged cool temperature) may delay or reduce weed control.

Crop safety: Applications of Achieve Liquid Gold to non-tillered crops exposed to 4°C temperatures before or after spraying should be avoided to prevent the possibility of crop injury. Tillered cereal crops may incur injury if Achieve Liquid Gold is sprayed within 48 hours of freezing temperatures.

9. How it Works: Achieve is a systemic herbicide that is absorbed through the leaves and translocated to the growing points within the plant where it starts killing the susceptible grasses. Thorough coverage of the foliage is important for consistent grass control. Buctril M contains two components, bromoxynil and MCPA. **Bromoxynil** is a contact herbicide inhibiting respiration and photosynthesis of the susceptible weeds. **MCPA** is a systemic herbicide absorbed through foliage and roots and is readily translocated to the actively growing regions of the plant.

10. Expected Results: Grassy weeds: growth stops in 48 hours. Young shoots turn brown in 7 - 8 days. Complete death of plant will take 2 - 3 weeks. Broadleaf weeds: small burnt spots on the leaf can appear within hours; death takes up to two weeks. Poor results may be expected as a result of poor coverage or poor penetration through canopy.

11. **Effects of Rainfall:** No effect 1 hour after application.
12. **Movement in Soil:** Achieve: no soil movement. This product will not leach in the soil. Buctril M: readily leached from the soil. Longer residual in dry soil.
13. **Cropping Restrictions:**

    Succeeding crops: No restrictions.

    Grazing restrictions: Immature crops may be grazed or cut for hay 30 days after treatment. Mature straw may be fed to livestock. Do not feed or graze underseeded forage crops in the year of treatment.

    Other restrictions: Pre-harvest interval is 60 days.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 2,950 mg/kg. Acute dermal LD_{50} (rats) = >5,000 mg/kg. Bromoxynil/MCPA: high acute mammalian toxicity. Acute oral LD_{50} (rats) = 365 mg/kg. Very toxic to birds and fish. Non-toxic to bees. May cause burns and may be absorbed through the skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before use.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place, away from children, animals, food, feed or fertilizers. Keep unused product in resealed original container. Store above -5°C. Shake well before reuse.
17. **Resistance Management:** Achieve Liquid Gold is a Group 1 herbicide. Any weed population may contain or develop plants naturally resistant to Achieve Liquid Gold and other Group 1 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Adrenalin *(AC 299,263 120 AS + 2,4-D Ester LV 700)*

Groups 2,4

Manufacturer: **BASF Canada**

1. **Formulations:**

    One case contains 2 split-neck jugs containing:
    1. AC 299,263 120 AS: Aqueous solution – 1.34 L/jug.
    2. 2,4-D Ester LV 700: Emulsifiable concentrate – 6.8 L/jug.
2. **Registered Mixes:** None.

    Surfactants: A non-ionic surfactant at 0.25 % volume/volume is required; i.e. add 2.5 L non-ionic surfactant per 1,000 L spray volume (Agral 90, Ag-Surf, Surf 92). Only use a surfactant with a minimum concentration of 80% active ingredient. The surfactant is not included in the Adrenalin case.

    Mixing instructions: Fill the tank 3/4 full with water. Start agitation. Pour the applicable number of Adrenalin jugs into the tank. Add the correct amount of non-ionic surfactant. If excess foaming occurs, add an anti-foaming agent (such as Halt). Continue filling the tank. Maintain agitation throughout mixing procedure and application.

Adrenalin (cont'd)

3. **Crops:** CLEARFIELD wheat only.

4. **Weeds Controlled:**

annual sow thistle
bluebur
cocklebur
cow cockle
daisy fleabane
false flax
flixweed
goat's-beard
green foxtail
kochia
lamb's quarters
mustards (except dog and tansy)
plantain
prickly lettuce
ragweeds
redroot pigweed
Russian pigweed
Russian thistle
shepherd's purse
stinging nettle
stinkweed
sweet clover
volunteer barley
volunteer canola (all types including all HT types)
volunteer wheat (non-CLEARFIELD)
wild mustard
wild oat
wild radish
wild sunflower

Top growth control

bull thistle
burdock
buttercup
Canada thistle
chicory
curled dock
field bindweed
hoary cress
mouse-eared chickweed
perennial sow-thistle
tartary buckwheat
teasel
yellow rocket

5. **Weeds Suppressed:**

blue lettuce
biennial wormwood
chickweed
cleavers
dandelion
groundsel
gumweed
hawkweed
heal-all
hedge bindweed
knotweed
leafy spurge
mustard (dog and tansy)
oak-leaved goosefoot
peppergrass
pineappleweed
prostrate pigweed
purslane
Russian knapweed
sheep sorrell
smartweed
velvet leaf
wild buckwheat
yellow rocket

6. **When Used:**

CLEARFIELD wheat: Application should be made from the 4 leaf up to and including the 6 leaf stage of CLEARFIELD wheat.

Grassy weeds: Application should be made when the grassy weeds are in the 1 to 6 leaf stage (total leaves including tillers with a maximum of 2 tillers).

Broadleaf weeds: Application should be made when the broadleaf weeds are in the cotyledon to 4 leaf stage.

7. **How to Apply:**

With: Ground equipment only.

Rate: AC 299,263 120 AS: 67 ml/ac.
2,4-D Ester LV 700: 340 mL/ac.

Surfactant: Non-ionic surfactant at 0.25% v/v (e.g. 2.5L/1,000 L spray solution).

Water volume: 40 L/ac.

Pressure: 275 kPa.

Nozzles: 50 mesh screens (or coarser). Flat fan recommended tilted 45 degrees forward for better penetration.

8. **Application Tips:** Do not apply Adrenalin more than once per year. If application of Adrenalin is early (prior to the 3 leaf stage), there may be 2,4-D damage. Application prior to the 3 leaf stage of wheat may cause severe twisting of leaves and leaf stem and head deformities, which may reduce yield. Do not spray if freezing or near freezing (+2°C) temperatures are forecast. Treat CLEARFIELD wheat during warm weather when weeds are actively growing and soil moisture is adequate for rapid growth. Under cool or dry conditions, control of some weeds may be severely reduced. Application must be made before the crop canopy shields the weeds. Ground application only.

9. **How it Works:** Absorbed by foliage and roots. Disrupts plant metabolism causing growth to stop. Works best under good growing conditions.

10. **Expected Results:** 2,4-D will cause twisting of the growing point. AC 299,263 will cause yellowing of the growing point. Grassy weeds will stop growing within 24 hours of application. After 7 - 10 days, symptoms start occurring. There is a definite yellowing of the growing point, interveinal chlorosis and newest leaves are noticeably affected by yellowing. Death occurs for grassy weeds in 14 - 21 days. Broadleaf weeds stop growing within 24 hours and weed activity stops within 1 - 5 days. There will be a twisting of the growing point (result of the 2,4-D component) and yellowing of the growing point (result of the AC 299,263).
11. **Effects of Rainfall:** A rain-free period of 3 hours is recommended.
12. **Movement in Soil:** The AC 299,263 and 2,4-D Ester LV 700 components do not leach appreciably.
13. **Cropping Restrictions:**

    Drift: Small amount of drift may damage sensitive plants such as legumes.

    Minimum interval to harvest: 79 days.

    Succeeding crops: Spring wheat, durum wheat, spring barley, field peas, CLEARFIELD and non-CLEARFIELD canola, lentils, oats and flax can be grown safely the year following an application. There are insufficient data for following with other crops. Conduct a field bioassay (a test strip grown to maturity) the year before growing any crops other than those listed above. In case of crop failure, replant only to CLEARFIELD wheat or CLEARFIELD canola. For other crops, call BASF at 1-877-371-2273.

    Grazing restrictions: Do not graze the treated crop within 14 days of application or cut for hay within 42 days of application.
14. **Toxicity:** AC 299,263: Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 5,000 mg/kg. Non-toxic to fish, birds and bees. 2,4-D Ester LV 700: Moderate acute mammalian toxicity.
    Acute oral LD_{50} (rats) = technical 300 - 1,200 mg/kg. Some formulations may cause skin irritation. Some formulations are toxic to fish. May cause burns and can be absorbed through the skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard had, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If on skin, remove contaminated clothing. Wash hands with soap and water after handling. **In case of eye contact**, flush with plenty of water. Get medical attention or contact a poison control centre immediately. **If swallowed**, do not induce vomiting. Get medical attention or contact a poison control centre. **If inhaled**, remove individual from site of exposure.
16. **Storage:** Store above 5°C. Store in a cool, dry place away from children, animals, food, feed or fertilizers. Keep from freezing.

Ally Toss-N-Go *(metsulfuron methyl)*

Group 2

Manufacturer: **DuPont Canada Inc.**

CAUTION POISON

1. **Formulations:** Dry flowable; 60%; Toss-N-Go 122 g (4 x 30.5 g) water soluble pouches.
2. **Registered Mixes:** 2,4-D Amine 500 (340 - 450 mL/ac + surfactant), 2,4-D LV Ester 700 (240 - 320 mL/ac), Avenge 200-C (1.72 L/ac, no surfactant), Avenge 200-C + MCPA Ester (1.7 L/ac + 280 - 400 mL/ac, no surfactant), MCPA Amine or Ester 500 (280 - 450 mL/ac + surfactant), Puma^{120} Super (156 - 312 mL/ac, no surfactant), Horizon (95 - 115 mL/ac) + Score surfactant). Consult tank mix partner labels for mixing instructions and additional crop staging restrictions.

    Surfactants: Ag-Surf, Agral 90, Citowett Plus, Companion, Super Spreader-Sticker.

Ally Toss-N-Go (cont'd)

Mixing instructions: Add 1/2 required amount of water. While agitating, add Ally and ensure it is completely suspended. Add second herbicide, if required. Complete filling, then add surfactant if required. Continuous agitation is required. If anti-foam is needed, add it last.

3. **Crops:** Barley, spring and durum wheat, established creeping red fescue, orchard grass, crested and intermediate wheat grass (seed or forage) (soil pH 7.9 or lower).
   Pasture and rangeland: Western snowberry, wild rose only.
   Note: Not recommended for underseeding with legumes or other grasses not listed.
4. **Weeds Controlled:**

Ally 3 g/ac + surfactant

ball mustard
bluebur (7.8)
chickweed (8.9)
common groundsel (8.6)
corn spurry (8.1)
cow cockle (8.8)
flixweed (6.6)
green smartweed (7.2)
hemp-nettle (8.8)
kochia (8.0)
lady's-thumb (8.5)
narrow-leaved hawk's-beard
prostrate pigweed (7.3)
redroot pigweed
scentless chamomile (8.3)
shepherd's-purse (8.8)
stinkweed (8.8)
stork's-bill (7.7)
tartary buckwheat (8.3)
volunteer rapeseed (excluding CLEARFIELD) (8.6)
wild mustard (8.8)

Ally 2 - 3 g/ac + MCPA + surfactant

annual sunflower
ball mustard
bluebur*
chickweed (8.6)
common groundsel*
corn spurry*
cow cockle (8.7)
flixweed (7.6)
green smartweed (8.5)
hemp-nettle (8.5)
kochia (6.7)
lady's-thumb*
lamb's-quarters
plantain
prickly lettuce
prostrate pigweed*
redroot pigweed (8.0)
Russian pigweed
Russian thistle (8.0)
scentless chamomile*
shepherd's-purse (7.6)
stinkweed (8.6)
stork's-bill*
sweet clover
tartary buckwheat*
tumble mustard
volunteer rapeseed (including CLEARFIELD) (8.6)
wild mustard (8.7)
wormseed mustard

Ally 2 - 3 g/ac + 2,4-D + surfactant

annual sunflower
ball mustard
bluebur*
chickweed
common groundsel*
corn spurry*
cow cockle (8.6)
flixweed (9.0)
green smartweed (8.6)
hemp-nettle (8.4)
kochia (7.4)
lady's-thumb*
lamb's-quarters
narrow-leaved hawk's-beard (spring seedlings only)
plantain
prickly lettuce
prostrate pigweed*
redroot pigweed (8.3)
Russian pigweed
Russian thistle (7.7)
scentless chamomile*
shepherd's-purse (6.2)
stinkweed (8.2)
stork's-bill*
sweet clover
tartary buckwheat*
volunteer rapeseed (including CLEARFIELD)
wild mustard (8.7)
wormseed mustard

* Weeds controlled only when mixtures contain Ally at 3 g/ac.

5. **Weeds Suppressed:** Ally + surfactant 3 g/ac: annual sow-thistle, Canada thistle, lamb's-quarters, perennial sow-thistle, Russian thistle, toadflax, wild buckwheat (6.8).
   Ally 2 g/ac + 2,4-D + surfactant: Canada thistle (7.1), wild buckwheat (6.7).
6. **When Used:**

Crop stage:

Post-emergent treatments	Crop stage	Crops
Ally	2 leaf - flag leaf	barley, wheat, creeping red fescue
Ally + 2,4-D (Amine/Ester)	full 3 leaf - just before flag leaf	barley, wheat
Ally + MCPA (Amine/Ester)	full 3 leaf - just before flag leaf	barley, wheat
Ally + Avenge	2 leaf - 6 leaf (shot blade)	barley, wheat
Ally + Avenge + MCPA Ester	3 leaf - 6 leaf (shot blade)	barley, wheat
Ally + Puma^{120} Super	1 leaf - 5 leaf + 2 tillers	barley
	1 leaf - 6 leaf + 3 tillers	wheat (including durum)
Ally + Horizon	2 leaf - flag leaf	spring wheat only
Ally + Assure II + surfactant	2 leaf - flag leaf	creeping red fescue

Weed stage: 2 - 4 leaf stage. For best results, apply to actively growing weeds. Note: Apply before crop canopy is dense enough to prevent thorough coverage of weeds.

7. **How to Apply:**

   With: Ground equipment. Do **not** apply by air.

   Rate: When used alone: Ally 3 g/ac. When used with 2,4-D or MCPA: Ally 2 - 3 g/ac.

   Surfactant: 2 L/1,000 L spray solution.

   Water volume: 40 L/ac (minimum).

   Pressure: 275 kPa.

   Nozzles: Flat fan types. 50 mesh or larger screens. Only metal or nylon filters.

   Sprayer cleanup: To avoid injury to susceptible crops, thoroughly clean sprayer immediately after spraying. Ammonia must be used to deactivate Ally when cleaning equipment.

   1. Drain and flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to ensure removal of all visible residues of Ally. If necessary, repeat Step 1.
   2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water and ammonia to completely fill tank so that all surfaces are in contact with the solution. Allow to sit for 15 minutes **with agitation**. Again flush the hoses, boom and nozzles with the cleaning solution and drain tank.
   3. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
   4. Repeat Step 2.
   5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.
8. **Application Tips:** Effectiveness may be reduced if spray mixture remains in tank for more than 48 hours.
9. **How it Works:** Ally is absorbed by the foliage and roots, readily translocated throughout the plant and inhibits the cell division.
10. **Expected Results:** Discolouration of the dying weeds may not be noticeable for 1 - 3 weeks after application. **Poor results may be expected if** there is improper mixing, timing, coverage or when weeds are under drought stress or moisture stress.
11. **Effects of Rainfall:** Heavy rainfall immediately before or after application may cause temporary lightening of crop. Rainfall within 2 hours of application may lessen degree of weed control.
12. **Movement in Soil:** Movement is restricted by fine textured soils, soil organic matter and neutral to acidic conditions.
13. **Cropping Restrictions:** Do not use on soils with pH greater than 7.9. Do not apply to irrigated land where tail water will be used to irrigate other crop land.

		Minimum recropping intervals (months)*	
Crops for rotation	**Soil pH**	**Black/Grey Wooded soils**	**Brown/Dark Brown soils**
Alfalfa, peas, red clover	7.5 or lower	22	Field bioassay
Barley, durum wheat	7.9 or lower	10	10
Canary seed	6.9 or lower	48	48
	7.0 to 7.9	48	48
Canola, flax	6.9 or lower	10	22
Canola	7.0 to 7.9	22	34
Fescue	7.5 or lower	10	Field bioassay
Flax	7.0 to 7.9	34	34
Lentils	6.9 or lower	34	34
	7.0 to 7.9	48	48

(continued)

Ally Toss-N-Go (cont'd)

(continued)		Minimum recropping intervals (months)*	
Crops for rotation	**Soil pH**	**Black/Grey Wooded soils**	**Brown/Dark Brown soils**
Oats	6.9 or lower	10	10
	7.0 to 7.9	10	22
Yellow mustard	6.9 or lower	48	48
	7.0 to 7.9	48	48
All other crops	7.9 or lower	Field bioassay	Field bioassay

* If land has been treated with Ally and Assert the same year or in successive years, seed only wheat, excluding durum, until a field bioassay demonstrates that other crops can be seeded. When recropping to broadleaf crops following an Ally application, extend the rotational interval by 1 year if rainfall was less than 130 mm in the Brown and Dark Brown Soil Zones or 250 mm in the Black and Grey Wooded Soil Zones in any year within the stated interval prior to planting.

Grazing restrictions: Wheat, barley or forage crops may be grazed by or fed to livestock any time after treatment.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place.
17. **Resistance Management:** Ally Toss-N-Go is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Ally Toss-N-Go and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Amitrol 240 *(amitrole)*

Group 11

Manufacturer: Nufarm Canada

CAUTION POISON

1. **Formulations:** Liquid; 231 g/L; 10 L containers.
2. **Registered Mixes:** Glyphosate. Follow directions on product label for timing and use precautions.
3. **Crops:** Pre-plant: barley, canola, corn, field peas, wheat, white beans. Non-crop areas: ditch banks, fence rows, pasture, roadsides, shelterbelts. Post harvest: grains, peas. After final cutting alfalfa, clover (renovation).
4. **Weeds Controlled:**

    annual sow-thistle
    annual weeds (most)
    Canada thistle (7.4)
    cattails
    dandelion
    field horsetail
    hoary cress
    leafy spurge
    perennial sow-thistle
    quackgrass
    showy milkweed
    toadflax
5. **Weeds Suppressed:** None.

6. When Used:

Crop stage: Alfalfa, clover renovation: After final cutting, generally not after October 1. Pre-planting crops: Barley, canola, corn, field peas, wheat, white beans. Crops: Non-selective, spot treatment. Post-harvest: Generally not after October 1. Shelterbelts: In established plantings only.

Weed stage: Canada thistle: Early bud to bloom. Cattails: After catkins are fully formed, up to frost. Field horsetail: During vigorous growth. Hoary cress and leafy spurge: Advanced rossette to bud stage. Milkweed: Early summer when all shoots have emerged. Quackgrass: 10 - 15 cm tall. Yellow toadflax: Advanced rossette to pre-bud.

7. How to Apply:

With: Ground equipment; hand sprayer. Do not apply by air.

Rate:

Pre-seed:

Crop	Rate (L/ac)	Weeds controlled	Days to plant
Barley, canola, wheat	1.7	Annual weeds, dandelion	0 - 1
Field peas	1.7	Annual weeds, dandelion	5 - 7

Post-harvest:

Timing	Rate (L/ac)	Weeds controlled
After harvest of crops	5 - 6.6	Canada thistle, sow-thistle

Alfalfa and clover renovation:

Crop	Rate (L/ac)	Plants controlled
Alfalfa	1.7 - 3.4	Alfalfa, annual weeds, dandelion
Alfalfa, clover	5.0 - 6.6	Alfalfa, annual weeds, Canada thistle, clover, dandelion, sow-thistle

Non-crop use:

Weed	Rate (L/ac)	Application directions
Dandelion	1.7 - 5	Treat when weeds are young and actively growing. Tillage can occur 3 weeks after treatment but is not necessary.
Canada thistle, sow-thistle	5 - 6.6	Apply when most thistles are in the early bud to bloom stage. Treated plants should not be mowed, but may be tilled 3 weeks later. Do not till infested areas during the fall or spring before treatments.
Cattails	15 - 18.5	Apply after catkins are fully formed and up to frost. Do not disturb sprayed plant. Do not apply where water will be used for irrigating, drinking or other domestic uses. Do not apply where water is not wholly confined to users property.
Field horsetail	5 - 6.6	Spray when field horsetail is growing vigorously during the vegetative growth stage. Usually when 10 - 15 cm in height.
Hoary cress	7.5 - 11	Spray during advance rosette and bud stages. Treated area should not be mowed. If necessary re-treat with one half the original rate when re-sprouts are 10 - 15 cm tall.

(continued)

Amitrol 240 (cont'd)

(continued)

Weed	Rate (L/ac)	Application directions
Leafy spurge	15 - 18.5	Spray between the advanced flowering and early seed development stage. Treated areas should not be mowed but may be plowed after top growth is bleached. Spot treat re-growth the following year.
Milkweed	7.5 - 11	Spray in early summer when a majority of shoots have emerged. Spot treat any re-growth the following year.
Quackgrass	5 - 6.6	Apply when growth is 10 - 15 cm in height. For best results, cultivate 3 weeks after treatment.
Poison ivy, poison oaks	3.7	Apply in 500 to 1,000 litres of water per hectare as an overall spray or as a spot treatment. Apply any time after foliage is fully developed in spring until plants begin to turn colour in the fall. Spray thoroughly, wet leaves, stems and suckers to ground line.
Toadflax	7.5 - 11	Treat during advanced rosette to pre-bud stage. Till 3 weeks after treatment when top growth is bleached. Spot treat any re-growth the following year.

Orchard and shelterbelt use:

Use	Rate (L/ac)	Weeds controlled
Apple orchards	3.8 - 5.5	Annual weeds, Canada thistle, dandelion, poison ivy, poison oak, sow-thistle, suppression of quackgrass
Shelterbelts	7.6 - 11	Annual weeds, Canada thistle, dandelion, field horsetail, hoary cress, milkweed, poison ivy, poison oak, quackgrass, sow-thistle, toadflax

Water volume: Non-crop areas: 40 - 120 L/ac minimum. Crop areas: 20 - 80 L/ac; Shelterbelts: 40 - 120 L/ac.

Pressure: 150 - 275 kPa.

8. **Application Tips:** Spray to point of runoff, complete coverage of weeds essential. Under or around desirable plants or trees; avoid contact with foliage, green stems or fruit as severe injury or destruction may result. Use a hooded sprayer if necessary. Do not disturb or mow treated plants for at least 2 weeks after treatment. If no tillage is possible, then spot treat weed regrowth with 1/2 original rate. Do not apply where water will be used for irrigating, drinking or other domestic use. Do not spray near sparks or open flame. For best results, apply Amitrol 240 in the early morning or evening when the humidity is higher. Avoid application when daytime temperatures exceed 25°C or when air conditions are very dry.
9. **How it Works:** Systemic herbicide that inhibits chlorophyll production. Moves through foliar and root system.
10. **Expected Results:** Whitening begins in 7 - 14 days and plants die. Poor results may be expected if poor coverage, inadequate rate, plants over-mature or under drought stress or if tilled too soon after application.
11. **Effects of Rainfall:** Heavy rain within 6 - 8 hours reduces effectiveness.
12. **Movement in Soil:** Average field half-life is 14 days.
13. **Cropping Restrictions:**

Succeeding crops: Crops, other than those listed in a pre-seed application may be seeded 8 months after treatment with Amitrol 240.

Grazing restrictions: Do not graze treated crops or weeds; sufficient data is not available to support such use. Most crops susceptible to drift.

14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical amitrole >4,000 mg/kg. technical ammonium thiocyanate – carrier 764 mg/kg. May be irritating to skin and eyes. Non-toxic to fish and birds. **Caution:** Possible human goitrogen. Do not apply on foraging bees.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for Cleaning of Clothes and *Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention. Do not re-enter treated areas within 12 hours.
16. **Storage:** Do not freeze or store above 30°C. No shelf life limitation. If frozen, contents will crystallize – to re-suspend, warm to 27°C and agitate as necessary.
17. **Resistance Management:** Amitrol 240 is a Group 11 herbicide. Any weed population may contain or develop plants naturally resistant to Amitrol 240 and other Group 11 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Arsenal *(imazapyr)*

Group 2

Manufacturer: BASF Canada

CAUTION POISON

1. **Formulations:** Aqueous solution; 240 g/L; 9.5 L container.
2. **Registered Mixes:** None.

    Surfactants: Only required if spray volume is greater than 223 L/ac. Use non-ionic surfactant at 1 L/400 L of spray solution.

    Foam reducing agent: May be added at the recommended rate, if required.
3. **Crops:** Non-crop/non-graze areas such as industrial sites or rail road ballast. Spot treatments for hydro, pipeline and rail rights-of-way; pipeline stations including well sites; battery stations and compressor or valve stations.
4. **Weeds Controlled:**

Annual broadleaf weeds

annual sow-thistle
black medic
common groundsel
hemp-nettle
kochia
lamb's-quarters
mustard spp.
pigweed spp.
pineappleweed
ragweed spp.
rough cinquefoil
Russian thistle
stinkweed
wild buckwheat

Annual grass weeds

annual bluegrass
foxtail spp.
old witchgrass

Perennial/biennial weeds

bladder campion
bull thistle
burdock
Canada thistle
clover spp.
dandelion
dog-strangling vine
field bindweed
goat's-beard
goldenrod
leafy spurge
milkweed
mouse-eared chickweed
mullein spp.
ox-eye daisy
plantain spp.
poison ivy
sheep sorrel
sulphur cinquefoil
toadflax
tufted vetch
wild carrot
wild grape
wild strawberry

Arsenal (cont'd)

Perennial grass/sedge weeds

bromegrass
Canada bluegrass
fescue spp.
quackgrass
yellow nutsedge

Woody species (seedling)

maple
poplar
raspberry
wild rose

5. **Weeds Suppressed:** None.
6. **When Used:**

   Weed stage: Apply post-emergent to actively growing weeds and seedling woody species.
7. **How to Apply: This product is to be applied by licensed applicators only.**

   With: Ground equipment: high volume, high pressure handguns and vehicle-mounted directed spray equipment or conventional boom-mounted, manifold-mounted or off-centre nozzles. Low volume hand-held backpacks, knapsack or other pump-up type sprayers may also be used for direct applications to foliage.

   Rate: 1.21 L/ac.

   Water volume: 40 - 223 L/ac.

   Pressure: 175 - 425 kPa.

   Nozzles: Select proper nozzles to avoid spraying a fine mist. Recommended nozzle tips include: Spraying Systems 1503E, 1504E, 1506E, 2003E, 2004E, 4003E or 4004E Flat Fan Tip; Spraying Systems 5500X-3 or X-4 Adjustable Cone Tip; Spraying Systems 5780 Cone Tip (attached to a Model 43L Gunjet or comparable applicator).

   Sprayer cleanup: Thoroughly clean all traces of Arsenal from application equipment immediately after use. Flush tank, pump, hoses and boom with several changes of water after removing nozzle tips and screens. Clean nozzles and screen separately. Drain and flush equipment away from desirable trees and plants. Do not contaminate water when disposing of equipment wash waters.
8. **Application Tips:** Apply in sufficient water (40 - 223 L/ac) to wet all foliage during periods of active growth. Do not mix or store in unlined steel (except stainless steel) containers or spray tanks. Do not use where roots from desirable vegetation may extend into the treated area. Maintain a distance from desirable trees equal to at least twice the distance from the trunk to the drip-line. Do not apply where runoff water may flow onto agricultural land.
9. **How it Works:** Absorbed by both roots and foliage of sensitive vegetation. Translocated throughout the plant including the root system in both the xylem and the phloem. Non-selective. Plant stops growing shortly after application.
10. **Expected Results:** Plants stop growing within 24 - 48 hours. Yellow, purplish and/or red discolouration of the leaves may occur. The growing point of the plant and the youngest leaves begin to die first, with symptoms eventually progressing to older leaves. Chlorosis and tissue necrosis may not be apparent in some plant species until 2 weeks after application. Complete kill of plants may not occur for several weeks. Season-long control of sensitive species.
11. **Effects of Rainfall:** Rainfall within 2 hours may decrease foliar activity. Rainfall does not affect root activity or the control of non-emerged sensitive species.
12. **Movement in Soil:** Is not leached appreciably.
13. **Cropping Restrictions:** Non-crop/non-graze applications only.

    Grazing restrictions: Do not graze the treated area or cut for hay.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD$_{50}$ (rats) 5,000 mg/kg. Non-toxic to fish, birds and bees.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store above -12°C. Arsenal should not be mixed or stored in unlined steel (except stainless steel) containers or spray tanks.
17. **Resistance Management:** Arsenal is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Arsenal and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Assert 300 *(imazamethabenz)*

Group 2

Manufacturer: **BASF Canada**

CAUTION POISON

1. **Formulations:** Suspension concentrate 300g/L; 10.8 L jug.
2. **Registered Mixes:**

   Barley, durum wheat and spring wheat: 2,4-D Ester, MCPA Ester, Puma^{120} Super, Puma^{120} Super + MCPA Ester, Puma^{120} Super + Refine Extra, Attain, Curtail M, Estaprop, Express Pack, Refine Extra + MCPA Ester, Unity 75WG + Unity 280EC, Frontline, Spectrum.

   Spring wheat (including durum): Turboprop 600, Puma^{120} Super, Puma^{120} Super + Refine Extra, Trophy.

   Barley and spring wheat (not including durum): Prestige. Do not tank mix Assert when used on sunflowers.

   Mixing instructions: Fill tank 3/4 full with water, start agitation. If mixing with Express Pack, Frontline, Refine Extra, Spectrum or Unity 75WG, add the Express Pack, Frontline, Refine Extra, Spectrum or Unity 75WG to the tank and agitate, mixing thoroughly to ensure the product is completely dissolved. Add one package of Spray Water pH Adjuster per jug of Assert to tank and agitate until dissolved. Add Assert to the partially filled tank while agitating. If using MCPA Ester, 2,4-D Ester, Estaprop, Curtail M, Prestige, Puma^{120} Super, Trophy, Turboprop 600 or Unity 280EC in the tank mix, add broadleaf herbicide first to the partially filled tank while agitating. Fill remainder of tank with water and agitate, or, cycle at least five minutes before spraying to ensure thorough mixing. Continue agitation until spraying is complete.

   Note: When using Express Pack, Refine Extra or Unity on repeated tank loads, if any tank mix solution remains in the tank, prepare a slurry and add it to the 3/4 filled tank.

   Mixing restrictions: Do not tank mix with phenoxy amines.

   Mixing rates: MCPA Ester (500 g/L) up to 0.45 L/ac; 2,4-D Ester (570 g/L) up to 0.4 L/ac. Refine Extra (8 g/ac) and Refine Extra (8 g/ac) + MCPA Ester (500 g/L) up to 0.45 L/ac, Estaprop (710 mL/ac), Express Pack (4 g/ac Express Plus 0.25 L/ac 2,4-D Ester), Curtail M (0.8 L/ac), Turboprop 600 (710 mL/ac), Unity 75WG (4.3 g/ac), Unity 280EC (200 mL/ac), Prestige (A - 320 mL/ac, B - 809 mL/ac), Frontline (40 mL/ac Frontline A, 335 mL/ac Frontline B), Spectrum (40 mL/ac Florasulam, 600 mL/ac Curtail M), Puma^{120} Super (116 mL/ac), Trophy (240 mL/ac – Trophy A Starane, 450 mL/ac – Trophy B MCPA Ester).
3. **Crops:** Annual rye grass (grown for seed), barley (all varieties)(8.5), durum wheat (all varieties)(8.3), spring wheat (all varieties)(8.8), sunflowers (all varieties including semi-dwarf and sunola).
4. **Weeds Controlled:** Stinkweed (8.2), wild mustard (7.8), wild oats (7.8). Sunflower rate will control stinkweed and wild mustard only.
5. **Weeds Suppressed:** Tartary buckwheat (3.5), wild buckwheat (5.4).

Assert 300 (cont'd)

6. **When Used:**

Crop stage: Barley (all varieties), spring wheat (including durum): Up to and including 6 leaf stage (before the flag leaf). Sunflower: 2 - 8 leaf (less than 38 cm high for regular varieties, less than 30 cm for semi-dwarf varieties, and less than 10 cm high for dwarf varieties). Annual rye grass grown for seed: 4 - 6 leaf stage.

Note: When mixed with 2,4-D Ester, MCPA Ester, Estaprop or Turpoprop, do not apply before 4 leaf stage of the crop. Do no apply Assert within five days of any herbicide that is not a registered tank mix with the exception of Ally, Laser or Lontrel.

Weed stage: Wild oats: 1 - 6 leaf stage (all leaves, including tillers). Wild mustard and stinkweed: Cotyledons to 6 leaf stage. Suppression of tartary and wild buckwheat: Cotyledons to 4 leaf stage.

7. **How to Apply:**

With: Ground equipment only.

Rate:

			Assert tank mixes (L/ac)	
Soil zones	**Wild oat stage**	**Assert alone (L/ac)**	**Puma^{120} Super**	**All others**
Black and Grey Wooded	1 - 3 leaves	0.54	0.54	0.67
	4 - 6 leaf stage (all leaves, including tillers), up to 2 tillers	0.67	0.54	0.67
Brown and Dark Brown	1 - 3 leaves	0.54	0.54	0.54
	4 - 6 leaf stage (all leaves, including tillers), up to 2 tillers	0.67	0.54	0.67

Sunflower rate: 0.34 L/ac.

Water volume: Assert tank mixed with Refine Extra, Refine Extra + MCPA Ester, Curtail M, Express Pack, Frontline, Prestige, Puma^{120} Super, Spectrum, Trophy, Unity: 40 L/ac. Assert alone, Assert tank mixed with 2,4-D Ester, MCPA Ester or Estaprop: 20 L/ac.

Water: Use Assert with the pH reducing agent Spraywater pH Adjuster or poor weed control may occur. For ground-driven pump systems, ensure Spraywater pH Adjuster is dissolved before engaging pump.

Pressure: 275 kPa.

Nozzles: Flat fan recommended, tilted 45° forward for better penetration. 50-mesh screens and filters.

8. **Application Tips:** Do not spray if freezing temperatures are forecast.

9. **How it Works:** Absorbed by foliage and roots and translocated to the growing points in the plants. Disrupts plant metabolism causing growth to stop in susceptible plants. Works best under good growing conditions.

10. **Expected Results:**

Wild oats: Stop growing within 24 - 48 hours. Yellow striping and purplish discolouration of the leaf may occur. Leaves begin to die in 3 - 10 days, starting with the youngest and moving to the older leaves. Death of the plant may occur in 1 - 3 weeks. Symptoms may occur more slowly at lower temperatures and high rainfall.

Stinkweed and wild mustard: Begin to yellow and die in 3 - 10 days; usually die before the wild oats. At the sunflower rate, injury signs on the wild mustard may take up to 2 weeks. Death may not occur for several weeks.

Wild and tartary buckwheat: Will slow or stop growth. Competition from these weeds will be reduced.

11. **Effects of Rainfall:** Rainfall within 6 hours may decrease activity.

12. **Movement in Soil:** Is not leached appreciably.

13. **Cropping Restrictions:** Do not apply Assert to the same field two years in a row.

    Succeeding crops:

    Black and Grey Wooded soil zones: Rotate to spring wheat, durum wheat, barley, sunflower, canola (including CLEARFIELD), flax and peas the year following Assert.

    Brown and Dark Brown soil zones: Rotate only to wheat, durum wheat, barley, CLEARFIELD canola and sunflowers the year following Assert. Two years after application of Assert, the following crops can be grown in all soil zones: wheat (spring and durum), barley, sunflower, peas, canola (including CLEARFIELD), flax, oats and canary grass. Conduct a field bioassay before planting lentils or sugar beets.

    Grazing restrictions: Fields treated with Assert may be grazed, cut for hay and fed to livestock after harvest of the grain.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 3,078 mg/kg. Non-toxic to fish, birds or bees.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Do not freeze.

17. **Resistance Management:** Assert 300 is a Group 2 herbicide. Any weed population may contain plants naturally resistant to Assert 300 and other Group 2 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Assure II *(quizalofop-p-ethyl)*

Group 1

Manufacturer: **DuPont Canada Inc.**

1. **Formulations:** Emulsifiable concentrate; 96 g/L; 1 x 8 L + 8 L Sure-Mix.

2. **Registered Mixes:** Canola: Muster (8 - 12 g/ac); creeping red fescue: Ally (3 g/ac).

   Mixing instructions:

   1. Make sure that spray tank is thoroughly cleaned before mixing.
   2. Fill tank half full with water. Keep agitator running.
   3. If tank mixing Assure II with Muster, use the following sequence:
      - Muster (ensure Muster is thoroughly dissolved before moving to next step)
      - Assure II
      - slowly add Sure-Mix
      - ensure that the herbicide is completely mixed before proceeding to the next step
   4. Add the rest of the required water to the tank. Mix well before applying to the crop.

   On repeat tank loads, ensure that the amount of spray solution left in the tank from the previous load is less than 10% of volume about to be mixed.

3. **Crops:** Canola, creeping red fescue (for seed production), field peas, flax (including linolenic acid varieties), lentils, navy beans, pinto beans, processing peas, seed alfalfa, seedling legumes (for seed production), soybeans, sugarbeets.

Assure II (cont'd)

4. **Weeds Controlled:** Barnyard grass, green foxtail, quackgrass, volunteer barley, volunteer corn, volunteer oats, volunteer wheat, wild oats.
5. **Weeds Suppressed:** Quackgrass at the 220 mL/ac rate.
6. **When Used:**

   Crop stage: Up to beginning of bolting of canola.

   Weed stage: Barnyard grass: 2 leaf to early tillering. Green foxtail: 2 leaf to early tillering. Volunteer barley, volunteer oats, volunteer wheat: 2 leaf to early tillering. Wild oats: 2 leaf to early tillering (up to 2 tillers). Yellow foxtail: 2 leaf to early tillering.

   Note: For best results on wild oats, apply prior to tillering. Use higher rate of Assure II when wild oats have tillers or when there is a heavy infestation of wild oats.
7. **How to Apply:**

   With: Ground equipment only. Do not apply by air.

   Rate: 150 - 300 mL/ac of Assure II plus Sure-Mix at 5 L/1,000 L of spray solution. In sugarbeets, if a second flush of annual grasses or volunteer cereals is observed, apply an additional application of Assure II at 150 mL/ac plus surfactant. Do not exceed an accumulative, seasonal use rate of 300 mL/ac of Assure per year.

Weeds	Rate
Green foxtail, volunteer barley, volunteer corn, volunteer oats, volunteer wheat, wild oats	150 mL/ac
Barnyard grass, quackgrass (suppression), plus above weeds	200 mL/ac
Quackgrass (season long)	300 mL/ac

   Water volume: 40 L/ac. Under heavy weed pressures, you can use up to 160 L/ac.

   Pressure: 210 - 275 kPa.

   Nozzles: Flat fan with 50 mesh or coarser nozzle screens.

   Sprayer cleanup: Thoroughly clean all traces of Assure II from application equipment immediately after use. Flush tank, pump, hoses and boom with several changes of water after removing nozzle tips and screens (clean these parts separately). Failure to thoroughly clean the equipment may result in injury to subsequently sprayed grass crops.
8. **Application Tips:** When using a broadleaf herbicide other than those registered for tank mixing with Assure II, wait a minimum of 24 hours after the Assure II application to apply the broadleaf herbicide, or wait 7 days after the broadleaf application to apply Assure II.
9. **How it Works:** Assure II is a systemic herbicide that is rapidly absorbed and readily translocated from the treated foliage to the root systems and growing points of treated plants.
10. **Expected Results:** Grassy weeds show a reduction in growth and a loss of competitiveness. An early yellowing or browning of the younger plant tissues is followed by a progressive collapse of the remaining foliage. These results will generally be observed in 1 - 3 weeks, depending on the grass species treated and the environmental conditions. **Poor results may be expected if** there is improper mixing, timing or coverage, or when weeds are under stress.
11. **Effects of Rainfall:** Rainfall within 1 hour of application may reduce control.
12. **Movement in Soil:** No soil movement.
13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze treated fields or harvest for forage or hay.

    Other restrictions: Do not apply to canola within 64 days of harvest. Do not apply to flax within 82 days of harvest. Do not apply to lentils or peas (field and processing) within 65 days of harvest.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) >5,000 mg/kg. May irritate eyes, nose, throat and skin.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place not below 5°C.
17. **Resistance Management:** Assure II is a Group 1 herbicide. Any weed population may contain plants naturally resistant to Assure II and other Group 1 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42).*

Atrazine *(atrazine)*

Group 5

Manufacturer: **Syngenta Crop Protection Canada Inc./United Agri Products**

1. **Formulations:**

    Liquid: Aatrex Liquid (Syngenta Crop Protection Canada Inc.); 480 g/L; 1 x 14 L.

    Water dispersible granule (WDG): Aatrex Nine-0 (Syngenta Crop Protection Canada Inc.); 90%; 1 x 10 kg pack.

    Flowable: Atrazine 480 (United Agri Products); 480 g/L; 2 x 10 L pack.
2. **Registered Mixes:** Crop oil concentrate, dry bulk granular fertilizers, nitrogen solutions or complete liquid fertilizers, Banvel II, Dual, Bladex, Duel.

    Mixing restrictions: Do not mix oil concentrates, surfactants or hormone type herbicides with any mixture of Atrazine plus Bladex. Tank mixes: add water, then Atrazine, agitate, add Bladex slowly, agitate thoroughly. **Note:** Crop oil concentrates must be added when Aatrex alone is applied post-emergent.
3. **Crops:** Field corn (9.0), sweet corn (8.6).
4. **Weeds Controlled:**

    annual smartweed
    common purslane
    lady's-thumb
    lamb's-quarters
    ragweed
    redroot pigweed
    volunteer clover
    wild buckwheat
    wild mustard
    wormseed mustard
5. **Weeds Suppressed:** None.
6. **When Used:**

    Crop stage: Pre-plant incorporated. Pre-emergent surface treatment (after planting but before emergence of the crop and weeds). Band applied or post-emergence: 1 to 6 leaf stage and when corn is less than 30 cm tall.

    Weed stage: Broadleaf weeds (post emergence applications): less than 10 cm tall.
7. **How to Apply:**

    With: Ground equipment.

    Rate: Aatrex Liquid, Atrazine 480: 0.85 - 1.25 L/ac. Aatrex Nine-O: 0.44 - 0.68 kg/ac.

    Note: Vary rates according to different soil types. (Lower rates in light and sandy soils. Higher rates in heavy clay soils).

Atrazine (cont'd)

Water volume: 60 - 120 L/ac.

Pressure: 200 - 300 kPa.

Nozzles: Flat fan recommended.

Incorporation: Only Aatrex Liquid, Atrazine 480, Aatrex Nine-O are applied pre-plant; Do not incorporate deeper than 5.0 cm. Pre-emergent treatments require rainfall within 10 days or a light cultivation.

8. **Application Tips:** Continuous gentle agitation is needed. Avoid excessive agitation, especially with oil mixtures, as a grease-like mass may form. Use oil mixes at once and clean tank and system with a strong detergent solution. Use 50 mesh or larger strainers and use only metal filters. Bypass line should discharge to bottom of tank. Band treatments are desirable when cultivation is to alleviate hard soil conditions or to control annual weeds.
9. **How it Works:** A systemic herbicide absorbed through both roots and foliage and it is translocated to the leaves where it inhibits photosynthesis.
10. **Expected Results:** Affected plants are slow to emerge and are wilted, yellowish and eventually turn brown and die. Poor weed control may be expected if improper incorporation is done, or when post-emergent application is made with oil concentrate or sprayed too late. Heavy rainfall on sandy soils may cause leaching and a decrease in weed control and/or crop injury.
11. **Effects of Rainfall:** Rainfall will activate the chemical, carrying it into the root zone where kill will begin.
12. **Movement in Soil:** Heavy rainfall on sandy soils may cause leaching and soil movement.
13. **Cropping Restrictions:** Plant only to corn in year of treatment. The use of atrazine on the prairies is not recommended when corn is grown in rotation with other crops except triazine-tolerant canola. Breakdown of atrazine in the soil is slow and may cause injury to sensitive crops (e.g. cereals, canola, sugar beets) one or more years after application. Crops most tolerant after corn and triazine tolerant canola are sorghum, then flax, faba beans and peas. The risk of damage to succeeding crops from atrazine residues may be reduced by ploughing or deep tilling treated fields in the fall prior to seeding the next crop in the rotation. Spreading and incorporating manure may also help to reduce the atrazine levels. Uneven application, excessive sprayer overlap or applications in excess of recommended rates will not injure corn but may result in a longer carryover of atrazine residues. A prolonged period of dry weather will also lengthen the time that atrazine residues remain in the soil.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) Aatrex = 1,075 mg/kg, Aatrex Nine-O = 1,600 mg/kg. May cause eye irritation. Very low toxicity to fish and birds. This product should not be mixed/loaded within 30 metres of any wells, lake, stream or pond to avoid potential well or surface water contamination.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** The flowable formulations should be kept from freezing. If stored in unheated areas, the product should be warmed and agitated thoroughly prior to using.
17. **Resistance Management:** Atrazine is a Group 5 herbicide. Any weed population may contain plants naturally resistant to Atrazine and other Group 5 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42).*

Attain *(fluroxypyr + 2,4-D LV Ester)*

Group 4

Manufacturer: **Dow AgroSciences Canada Inc.**

DANGER POISON

1. **Formulations:**

   Attain A: Fluroxypyr 180 g/L EC 9.6 L jug.

   Attain B: 2,4-D LV Ester 564 g/L EC 2 x 8.0 L jugs.

2. **Registered Mixes: Barley, spring wheat (excluding durum):** Achieve Liquid (200 mL/ac) + Turbocharge adjuvant, Assert 300SC (540 - 670 mL + acidulate). **Spring wheat (excluding durum):** Everest 70DF solupak (17.4 g/ac) + non ionic surfactant. Horizon (95 mL/ac) + Score adjuvant, Puma^{120} Super (312 mL/ac for barnyard grass, green foxtail and wild oats).

3. **Crops:** Barley, tall fescue (grown for seed) (established, seedling), spring wheat (except durum).

4. **Weeds Controlled:**

   annual sunflower
   bluebur
   burdock
   cleavers (1 - 4 whorls) (8.8)
   cocklebur
   flixweed (9.0)
   field horsetail*
   goat's-beard
   hoary cress*
   kochia*** (8.0)
   lamb's-quarters (8.8)
   mustards (except dog, green tansy)
   plantain
   prickly lettuce
   ragweed
   round-leaved mallow (1 - 6 leaf) (8.6)
   shepherd's-purse (9.0)
   stinkweed (8.9)
   stork's-bill (1 - 8 leaf) (8.4)
   sweet clover
   vetch
   volunteer canola (9.0)
   volunteer flax (1 - 12 cm) (8.4)
   wild buckwheat (1 - 4 leaf) (8.4)
   wild mustard (8.9)
   wild radish

   The following weeds will be controlled only when growing rapidly (control may be reduced when weed infestations are heavy or if flowering has initiated):

   blue lettuce*
   dandelion**
   docks
   dog mustard
   field bindweed*
   field peppergrass
   gumweed
   hairy galinsoga
   hedge bindweed
   lady's-thumb
   leafy spurge*
   oak-leaved goosefoot
   redroot pigweed (8.8)
   Russian thistle (7.6)
   smartweed (8.3)
   tansy
   tartary buckwheat

5. **Weeds Suppressed:**

   annual sow-thistle
   common chickweed*** (up to 8 cm) (7.2)
   Canada thistle (6.8)
   hemp-nettle (2 - 6 leaf stage) (7.7)
   perennial sow-thistle* (8.1)

   * Top growth control only.
   ** Spring rosettes.
   *** Including biotypes resistant to Group 2 herbicides that inhibit the ALS/AHAS enzyme.

6. **When Used:**

   Crop stage: Barley, spring wheat: 4 leaf to flag leaf stage.

   Weed stage: 2 - 4 leaf stage.

7. **How to Apply:**

   With: Ground equipment only. With sprayer that can apply 45 L/ac spray solution because lower water volume may cause mixing problems and/or unacceptable crop injury may occur.

   Rate:

   Attain A: 240 mL/ac.

   Attain B: 400 mL/ac.

Attain (cont'd)

Water volume: 45 L/ac.

Pressure: 135 - 270 kPa.

Nozzles: Flat fan type. Use 50 mesh or larger screens.

Mixing instructions: Only use in sprayers with good agitation. Ensure sprayer is properly cleaned prior to applying Attain.

1. Fill the sprayer with 1/2 the required amount of water, start agitation and continue agitation throughout the mixing and spraying procedure.
2. Add required number of jugs of Attain A, then Attain B.
3. Complete filling the sprayer tank.

8. **Application Tips:** Attain activity is influenced by weather conditions. Optimum activity requires active weed growth. Temperature range for optimum activity is 12°C to 24°C. Reduced activity will occur when temperatures are below 8°C or above 27°C. Frost before application (3 days) or shortly after (3 days) may reduce weed control and crop tolerance. Weed control may be reduced during stress conditions, e.g. heat, drought or cold or if weeds have initiated flowering or if heavy infestations exist. Wet foliage at time of application may result in reduced weed control. Optimum timing of application is 2 - 4 leaf stage of weeds. Application on cleavers can be made up to 6 whorl (20 cm height) stage. Do not apply to wheat and barley underseeded to legumes. Make only one application per year. Application prior to 4 leaf stage of wheat and barley may cause severe twisting of leaves and leaf stem and head deformities which may reduce yield up to 10%. Do not apply later than flag leaf stage of crop. Some twisting may be evident 1 week after application on barley. This twisting is transitory and will disappear within 3 weeks.
9. **How it Works:** Attain herbicide tank mix is non residual. The components of Attain tank mix move within the plant to control exposed and underground plant tissue. It mimics naturally occurring plant hormones and controls weeds by disrupting normal plant growth patterns. Symptoms include twisting of stems and swollen nodes.
10. **Expected Results:**

    Broadleaf weeds: Weeds start to twist shortly after spraying. After twisting and bending, plants stop growing, turn brown and die.
11. **Effects of Rainfall:** Do not apply if rain is expected in 1 hour.
12. **Movement in Soil:** 2,4-D and fluroxypyr bind lightly to soil organic matter but do not bind readily to sand, silt or clay. Due to their relatively short half life, they rarely move deeper than 15 cm deep in soil.
13. **Cropping Restrictions:**

    Succeeding crops: Fields treated with Attain herbicide tank mix can be seeded the following year to barley, canola, flax, forage grasses, lentils, mustard, oats, peas, rye, wheat or summerfallowed. Do not seed crops other than those listed above for at least one year following treatment.

    Drift: Broadleaf crops are sensitive to spray drift. Minimize drift by using nozzles that put out sufficient spray volume and large droplets.

    Grazing restrictions: Do not permit lactating dairy animals to graze fields within 7 days after application. Do not harvest forage or cut for hay within 30 days after application. Withdraw meat animals from treated fields at least 3 days prior to slaughter.

    Other restrictions: Do not harvest the treated mature crop within 60 days after application.
14. **Toxicity:** 2,4-D has moderate acute mammalian toxicity. Acute oral LD$_{50}$ = technical 639 - 764 mg/kg. Fluroxypyr has very low mammalian toxicology. Acute oral LD$_{50}$ >2,000 mg/kg.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a dry heated area. If product is frozen, bring to room temperature and agitate before use.
17. **Resistance Management:** Attain is a Group 4 herbicide. Any weed population may contain plants naturally resistant to Attain and other Group 4 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Avadex BW/MicroActiv *(triallate)*

Group 8

Manufacturer: **Monsanto Canada Inc.**

☠
WARNING POISON

1. **Formulations:** Emulsifiable concentrate; Avadex BW/MicroActiv Liquid; 400 g/L; 22.7 L pail. Granular; Avadex BW/MicroActiv Granular; 10%; 22.7 kg bags.
2. **Registered Mixes: Wheat and barley:** Rival or Treflan (for wild oats and green foxtail control), dry bulk or liquid fertilizers.

    Mixing instructions: Thorough mixing is essential. Agitation is required to suspend mixture or to resuspend if spray mixture is allowed to settle at any time.

    Mixing restrictions: Do not mix with nitrate fertilizers, they may cause explosions and fires.
3. **Crops:**

    barley (8.9)
    durum wheat (8.3)
    field peas (9.0)
    flax (8.9)
    mustard (9.0)
    rapeseed (8.2)
    spring wheat (8.3)
    sugar beets (8.0)

    Underseeding: Alfalfa, bird's-foot trefoil, clovers (provided they are not harvested for green feed, hay or silage in year of seeding). Do not underseed with grasses or legume-grass mix.
4. **Weeds Controlled:** Wild oats (7.6).
5. **Weeds Suppressed:** None.
6. **When Used:**

    Spring: Pre-plant incorporated on flax, mustard, peas, rapeseed, sugar beets. Pre-plant and post-plant incorporated on barley and wheat. Do not apply pre-plant with wheat in soils with 4% or less organic matter where discers are to be used for the seeding operation. Seed to the proper depth immediately or up to 3 weeks after application.

    Fall: All crops. Granules: September 15 to freeze-up. Liquid: October 1 to freeze-up.

    Note: For fall applications: where erosion may be a problem, maximize crop residue cover with only one fall tillage incorporation.

Avadex BW/MicroActiv (cont'd)

7. How to Apply:

With: Aircraft (granules only) or ground equipment.

Rate:

Spring Application

		Organic matter			
		4% or less		Greater than 4%	
Crops	**Application timing**	**Liquid L/ac**	**Granules kg/ac**	**Liquid L/ac**	**Granules kg/ac**
Barley	Before and after seeding	1.4	5.7	1.7	6.9
Flax, mustard, rapeseed, sugar beets	Before seeding	1.7	6.9	2.2	8.9
Peas (dry)	Before seeding	1.7	NR*	1.7	NR
Durum wheat, spring wheat	Before seeding	1.2	4.4	1.4	5.7
	After seeding	1.4	5.7	1.7	6.9

* NR – Not Registered

Fall Application

	Organic matter					
	Less than 2%		2 - 4%		Greater than 4%	
Crops	**Liquid L/ac**	**Granules kg/ac**	**Liquid L/ac**	**Granules kg/ac**	**Liquid L/ac**	**Granules kg/ac**
Barley	1.2	4.4	1.4	5.7	1.7	6.9
Flax, mustard, rapeseed, sugar beets	1.4	5.7	1.7	6.9	2.2	8.9
Durum wheat, spring wheat	1.2	4.4	1.4	5.7	1.7	6.9
Minimum Tillage – fall or spring minimum tillage						
Barley	–	–	–	5.7	–	6.9
Flax, mustard, rapeseed, sugar beets	–	–	–	6.9	–	8.9
Durum wheat, spring wheat	–	–	–	5.7	–	6.9

Water volume: Liquid formulation only: 36 L/ac minimum.

Pressure: Liquid formulation only: 200 kPa.

Nozzles: Flat fan recommended.

Incorporation:

Avadex BW/MicroActiv in conventional tillage systems: Two incorporation operations are necessary for thorough mixing. For application made prior to seeding, incorporation with disc plus harrows or field cultivator plus harrows is recommended. The second incorporation should be at right angle to first, with suitable disc or cultivator type implement. For application made after seeding, shallowly incorporate to a depth of 4 - 5 cm using suitable equipment such as harrow. The second incorporation can be conducted any time prior to crop emergence. Adjust incorporation equipment to a depth that will not disturb the seed. Do not incorporate more than 5 cm. This can be accomplished by setting the tillage equipment to work the soil no deeper than 7.5 cm - 10 cm. Shallow incorporation is necessary to prevent dilution of the product, thus decreasing wild oat control and increasing the risk of crop injury.

Liquid: The first incorporation should be completed as soon as possible on the day of spraying.

Granules: The first incorporation should be completed within 48 hours of application. The second incorporation for both liquid and granules may or may not be done immediately after the first. For maximum results from spring application of granules, delay second incorporation for at least 3 - 5 days.

Avadex BW/MicroActiv + fertilizer banding: Avadex BW/MicroActiv may be broadcast prior to or in conjunction with fall fertilizer banding. Banding unit should be operated at no less than 8 km/h to provide adequate soil mixing. Depth of operation of banding unit should be as recommended for proper fertilizer placement. An effective shank spacing of 30 cm or less will provide optimum results.

Spring application: If Avadex BW/MicroActiv is applied in the spring prior to banding unit operated using knife-type openers, two additional incorporations are required at right angles.

Fall application: The use of tine harrow on banding unit is not required but may provide superior incorporation where excessive trash is not a factor. The second incorporation should be at right angle to the banding operation with suitable disc or cultivator type implement.

Avadex BW/MicroActiv in high disturbance systems (minimum tillage): A high disturbance incorporation can be conducted prior to seeding or as part of the seeding operation. A high disturbance system is one that disturbs the soil enough so that emerged weeds are controlled by the tillage. (High disturbance may be caused by the seed drill – cultivator or disc type, or with harrows following the seed drill or both.) Levelling the soil at or after seeding with harrows will ensure uniform product coverage and best performance. Application of granules 10 - 14 days prior to incorporation is rquired for best results.

8. **Application Tips:**

Choice of formulation: Use liquid formulation on soil free of trash. Use granules on all soils including those with heavy trash cover. Granules may be applied in the fall prior to or in conjunction with fertilizer banding.

Fall minimum tillage application: fall minimum tillage applications should be made when the average soil temperature at the 5 cm depth is 4°C or less and within 3 weeks of soil freeze-up. This situation generally occurs by October 1. No fall incorporation is required. Incorporation may be conducted in the spring prior to seeding or at seeding. Do not use this treatment on soil with less than 2% organic matter. Under excessively warm or wet conditions between application and crop emergence, control may be reduced. For best results on heavy wild oat infestations, use the incorporated treatments only.

Spring minimum tillage application: Apply Avadex BW/MicroActiv granules in the spring when average soil temperature at the 5 cm depth is 4°C or less. Applications should be made to soil which have adequate trash cover to prevent soil erosion between application and seeding. Ensure that the time between application and incorporation is a minimum of 10 - 14 days. Do not apply more than 4 weeks before intended seeding.

For optimum results with Avadex BW minimum tillage treatments, seed when wild oat growth is noticeable in the field. This will ensure that the soil is warm enough for activation of Avadex BW. Minimum tillage applications should not be made to fields covered with snow or excessive crop residue that will not allow granule contact with soil. If excessive crop residue exists at the time of application, a vigorous harrowing can be used to ensure that the herbicide granules make adequate contact with the soil. Under excessively warm or wet conditions between application and crop emergence, control may be reduced. For best results on heavy wild oat infestations, use the incorporated treatment only. Soil colour may not be a precise indicator of organic matter content. Ensure that the application rate chosen from the table is appropriate for your soil type.

Field preparation: Make sure the soil is in good working condition. Reduce trash to an acceptable level before application. If soil is excessively wet or lumpy, cultivate with suitable equipment to improve soil condition.

Seeding: Flax, mustard and rapeseed can be seeded in treated layers. Barley and wheat are more sensitive and should be planted 6.0 - 7.5 cm. Wheat must be seeded below the treated layer. After seeding, any deep ridges left by drills must be levelled by harrowing. Treflan/Rival Mixes: Drought conditions in the year of treatment may result in higher levels of Treflan/Rival carryover. To avoid wheat injury, seed 6.0 - 7.5 cm into warm, moist seedbed.

Avadex BW/MicroActiv (cont'd)

9. **How it Works:** Absorbed by germinating wild oat shoots, usually resulting in death before emergence. Under dry conditions, wild oats may emerge before being killed.

10. **Expected Results:**

    Wild oats: Usually kills wild oats before they emerge. Scraping away the soil 1 - 2 weeks following treatment will expose white to yellow wild oats shoots 2.0 - 2.5 cm in length with pinched tips. Plants which have emerged and absorbed a lethal dose will cease growth, leaves become brittle and bluish-green in colour. Under dry conditions, a rainfall of 1.5 cm or more when wild oats are emerging can cause post-emergent die-back of a high percentage of wild oat plants.

    Crop: Wheat seeded into the treatment zone under very dry soil conditions may be thinned and delayed when germinating and emerging just prior to a heavy rainfall. Wheat must be seeded at least 1.5 cm below the treated layer of soil (e.g. 5 - 7.5 cm). Some wheat thinning may be noted on eroded knolls. **Poor results may be expected if** incomplete incorporation due to wet, cloddy soil or heavy trash, incorporation delayed, very dry soil conditions in spring or prolonged cool soil temperatures at time of germination. Ridges left by seeding may disrupt the treated layer and allow escapes.

11. **Effects of Rainfall:** Moisture is required for activation. Rainfall of at least 1.5 cm within 2 weeks of application in the spring is required to ensure maximum performance.

12. **Movement in Soil:** Negligible.

13. **Cropping Restrictions:**

    Succeeding crops: Oats should not be seeded into soil treated with Avadex BW in the previous year.

    Drift: No effect on standing crops.

    Grazing restrictions: Treated underseeded legumes cannot be harvested for green feed, silage or hay in year of seeding. Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 1,675 - 2,165 mg/kg. May cause slight eye irritation. Slightly toxic to fish. Non-toxic to birds.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store above 0°C. If frozen, warm to 22°C and agitate to redissolve crystals.

17. **Resistance Management:** Avadex BW/MicroActiv is a Group 8 herbicide. Any weed population may contain plants naturally resistant to Avadex BW/MicroActiv and other Group 8 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Avenge 200-C *(difenzoquat)*

Group 8

Manufacturer: **BASF Canada**

WARNING POISON

1. **Formulations:** Liquid; Avenge 200-C; 200 g/L; 20 L pail.
2. **Registered Mixes: Avenge wheat varieties and barley:** 2,4-D Ester, Ally, Buctril M, Clean Crop (Diphenoprop 600, Estaprop, Turboprop 600, Dichlorprop-D, Interprop), Curtail M, 2,4-D B (Embutox 625, Caliber 400, Cobutox 400, 2,4-D Butryic 400), MCPA Ester, Pardner, Refine Extra, Thumper. **Avenge wheat varieties and barley under-seeded to legumes:** 2,4-DB (Embutox, Cobutox, 2,4-D Butryic 400). **Canary grass**: Buctril M, Pardner.

   Mixing instructions: Fill tank 1/2 - 3/4 full with water; start agitation. If mixing with Ally or Refine Extra, add the Ally or Refine Extra to the tank and continue agitation, mixing thoroughly to ensure product is completely dissolved. Add Avenge to the partially filled tank while agitating. If using a liquid broadleaf herbicide in the tank mix, add to the tank. Fill remainder of the tank with water and agitate, or cycle at least five minutes before spraying to ensure thorough mixing. Continue agitation until spraying is complete.

   Mixing restrictions: Do not mix or spray within 5 days any formulation containing MCPA Amine, Banvel II, DyVel, Target, 2,4-D Amine or Blagal.
3. **Crops:**

   barley (all varieties) (8.7)
   canary grass (8.4)
   fall rye (Cougar, Frontier, Kodiak, Puma, Rymin) (8.6)
   triticale (Carman, Welsh) (9.0)
   winter wheat (Norstar) (8.7)

   Forages underseeded to wheat or barley
   alfalfa (7.9)
   bird's-foot trefoil
   bromegrass (7.9)
   creeping red fescue (7.8)
   crested wheatgrass (7.0)
   Kentucky bluegrass
   meadow fescue (7.4)
   orchard grass (7.8)
   red clover (7.2)
   red fescue
   reed canary grass (7.0)
   Russian wild ryegrass (6.5)
   sweet clover (7.6)
   timothy (5.1)

   Do not treat underseeded legumes if they are to be grazed or used for feed.

   Seedling grasses for forage
   meadow foxtail
   meadow bromegrass
   pubescent wheatgrass
   streambank wheatgrass
   tall fescue
   tall wheatgrass

   Spring wheat (8.4) use only on the following varieties
   AC Barrie
   Biggar
   Bluesky
   CDC Macua
   CDC Teal
   Columbus
   Conway
   Cutler
   Fielder
   Genesis
   Glenlea
   Katepwa
   Kenyon
   Lancer
   Leader
   Neepawa
   Oslo
   Pasqua
   Selkirk
   Wildcat
4. **Weeds Controlled:** Wild oats (7.5).
5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Do not apply after the 6 leaf stage of barley, canary seed or wheat.

   Weed stage: 3 - 5 leaf stage of wild oats.

   Note: apply 3 - 4 leaf stage to minimize early wild oat competition. Very good control at 4 - 5 leaf stage, but yield increases may be reduced.
7. **How to Apply:**

   With: Aircraft or ground equipment. Do not apply Ally, Laser, Buctril M, Curtail M, Pardner, Embutox 625, Estaprop, Refine Extra tank mixes by air.

Avenge 200-C (cont'd)

Rate:

Wild oat infestation level	200-C air or ground
1 - 200 plants/m^2	1.4 L/ac
Over 200 plants/m^2	1.7 L/ac

Mixing rates: MCPA Ester (500 g/L): Up to 0.45 L/ac. 2,4-D Ester (570 g/L): Up to 0.4 L/ac. Ally: Use high rate of Avenge. Others: Label recommended rate.

Water volume: Air: 8 L/ac minimum; Ground: 40 L/ac; Spra-Coupe: 40 L/ac.

Pressure: 275 kPa.

Nozzles: Flat fan recommended; tilted 45° forward for better spray penetration. 50 mesh metal screens and filters.

8. **Application Tips:** Do not apply if the crop is stressed from extreme drought or excessive moisture. Do not spray if freezing temperatures are forecast. Avenge can be sprayed if leaf surface is wet, as long as the spray solution will not drip off the leaf surface after application. Apply a minimum of 30 days after seeding for best results.

9. **How it Works:** Acts on the growing point located at or just above the soil surface; placing herbicide at or below this point is most efficient. Disrupts cell division and elongation causing growth to stop. Best at high temperature and humidity.

10. **Expected Results:**

    Wild oats: Start to yellow within 3 - 5 days. Effect is faster when temperature and humidity are high. Affected plants will turn brown or remain stunted and partially green throughout the season but competitive effect will be removed. Wild oats in the 1 - 2 leaf stage at spraying or those that emerge after spraying will be unaffected.

    Crop: Slight yellowing may be visible 5 - 7 days after application and will remain visible for 2 weeks. **Poor results may be expected** if spraying before 3 leaf stage; too low a rate for wild oat population; inadequate coverage due to dense broadleaf weeds; drought or temperature stress.

11. **Effects of Rainfall:** Do not spray if rainfall is forecast within 6 hours of application.

12. **Movement in Soil:** Is strongly absorbed to soil particles, is not leached nor carried in runoff appreciably.

13. **Cropping Restrictions:**

    Drift: Only oats can be seriously affected by drift.

    Grazing restrictions: Do not graze or feed crop for 8 weeks after treatment. Treated underseeded forages or seedling grasses for forage should not be grazed or harvested for feed during the year of treatment.

    Crop use after hail: Do not process for 8 weeks after treatment.

14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD$_{50}$ (rats) = 863 - 912 mg/kg. Non-toxic to fish, birds or bees.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Headaches, tiredness and diarrhea.

16. **Storage:** Will withstand freezing temperatures, returning to full solution as temperature increases.

17. **Resistance Management:** Avenge 200-C is a Group 8 herbicide. Any weed population may contain plants naturally resistant to Avenge 200-C and other Group 8 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Banvel II *(dicamba)*

Group 4

Manufacturer: **BASF Canada**

1. **Formulations:** Solution 480 g/L diglycolamine salt formulation; 2 x 10 L jugs; 55 L.
2. **Registered Mixes: Barley, wheat:** Sencor, 2,4-D, MCPA. **Winter wheat:** 2,4-D, MCPA. **Canary seed and oats**: MCPA. **Corn, pasture, non-crop:** 2,4-D. **Chemical fallow, stubble**: 2,4-D, Roundup, Touchdown. **Red fescue, spring rye:** 2,4-D. Seedling grasses – 2,4-D.
3. **Crops:**

barley (8.2)
canary seed
durum wheat (8.2)
field corn
non-crop areas
oats (8.6)
pasture grasses
rangeland grasses
red fescue (seed crops)
reduced tillage
spring rye
spring wheat (8.2)
summerfallow stubble
winter wheat (8.2)

Seedling grasses

creeping fescue
crested wheatgrass
foxtail
intermediate wheatgrass
meadow fescue
orchard grass
pubescent wheatgrass
slender wheatgrass
smooth bromegrass
streambank wheatgrass
tall fescue
tall wheatgrass
timothy

4. **Weeds Controlled:**

Banvel II alone (crop rates): 95 - 115 mL/ac

annual smartweeds (6.4)
Canada thistle
cleavers (at 115 mL/ac rate)
corn spurry
cow cockle (6.9)
lady's-thumb
perennial sow-thistle*
tartary buckwheat (6.7)
wild buckwheat (7.9)

* Top growth only.

Banvel II + 2,4-D (crops rates, reduced tillage), Banvel II + MCPA (crop rates)

burdock
common ragweed
false ragweed
flixweed
giant ragweed
hare's-ear mustard
hemp-nettle*
Indian mustard
kochia
lady's-thumb
lamb's-quarters
prostate pigweed
redroot pigweed
Russian pigweed
Russian thistle
stinkweed
tartary buckwheat
wild buckwheat
volunteer canola
volunteer cow cockle
volunteer shepherd's-purse
volunteer sunflower
wild mustard
wild radish
wormseed mustard
tumble mustard

* Banvel II + MCPA only.

Banvel II alone (pasture, rangeland, non-crop areas; 2 rates)

Lower rate (0.67 L/ac)

Canada thistle
English daisy
field bindweed
goldenrod
perennial sow-thistle
tansy ragwort

Higher rate (1.9 L/ac)

diffuse knapweed
goat's-beard
ground cherry
pasture sage
poverty weed
sheep sorrel
thyme-leaved spurge

Banvel II + Roundup (reduced tillage, preseeding in direct seeding)

cleavers (1 - 4 whorls)***
cow cockle (8.6)
flixweed**
green foxtail (8.5)
kochia
lady's-thumb
lamb's-quarters
Persian darnel*
Russian thistle (8.0)
smartweed*
stinkweed (9.0)
volunteer brome
volunteer cereals
volunteer downy*
volunteer canola****
wild buckwheat*
wild mustard (8.9)
wild oats (8.4)

* Preseeding applications prior to direct seeding only.
** For flixweed, use 400 mL/ac rate of Roundup.
*** Suppression.
**** Excluding volunteer Roundup Ready Canola.

Banvell II (cont'd)

Banvel II + 2,4-D (brush)

alder
aspen poplar
cherry
western snowberry
wild rose
wolf willow

5. **Weeds Suppressed:** Controls top growth of Canada thistle and perennial sow-thistle and suppresses cleavers at in-crop rates. Top growth control of curled dock at lower pasture rate. Banvel II + Roundup suppresses foxtail barley, redroot pigweed and wild buckwheat. Banvel II + 2,4-D on reduced tillage controls top growth of Canada thistle and perennial sow-thistle. Apply Banvel II at 240 mL/ac + 600 mL of 2,4-D Amine in the spring for suppression of volunteer alfalfa in established grass pasture.

6. **When Used:**

Summerfallow: Banvel II alone for Canada thistle rosette only, cultivate in the early spring and continue as required. Final cultivation must occur by the end of July (between July 15 and August 1). To encourage rosette formation, the final cultivation should cut the thistles off at 5 - 7.5 cm below the soil surface. Under normal growing conditions, regrowth of Canada thistle should take 3 - 4 weeks. Apply Banvel II at least 2 weeks prior to a killing frost when the majority of Canada thistle plants are in the rosette stage and 15 - 25 cm in diameter. Resume cultivation 3 weeks after treatment. For maximum control, use Banvel II in a cereal crop the following year at the recommended crop stage and rate.

Banvel II + Roundup: For Canada thistle and/or perennial sow-thistle only, perform the final tillage operation the last week of July or first week of August. Allow thistles to regrow for a minimum of 4 weeks and apply when the majority of thistles have emerged. Apply before thistles reach early bud stage (15 - 25 cm tall).

Stubble: Banvel II alone or Banvel II + Roundup. When thistle regrowth is 10 - 15 cm tall. Apply 2 weeks prior to first killing frost.

Pastures, rangeland grasses: When weeds are actively growing or brush species are under 2 m tall.

Reduced tillage for annual weeds, summerfallow: Banvel II + Roundup on actively growing weeds from 8 - 15 cm tall. Banvel II + 2,4-D on actively-growing weeds at the 2 - 4 leaf stage.

Preseeding application in direct seeding: Banvel II + Roundup may be applied to emerging annual grasses and broadleaf weeds in direct seeding systems prior to seeding wheat, barley, oats and field corn (not sweet corn). Planting should follow soon after application since this tank mix does not provide residual weed control. Delayed planting following application will allow weeds to emerge between application and crop emergence.

Cleavers: Spray before 3 whorl stage for better control.

	Recommended Leaf Stage or Height of Crop					
Crop	**Banvel II/ alone**	**Banvel II + 2,4-D Amine 500**	**Banvel II + Ally****	**Banvel II + MCPA Amine 500**	**Banvel II + MCPA K 400**	**Banvel II + Metribuzin**
Barley	2 - 5	2 - 5	2 - 5	2 - 5	2 - 5	2 - 3
Canary seed	3 - 5	NR*	NR	3 - 5	NR	NR
Corn (post-emergent)	Up to 20 cm	Up to 10 cm	NR	NR	NR	NR
(drop nozzles)	20 - 50 cm	10 - 50 cm	NR	NR	NR	NR
Durum wheat	2 - 5	2 - 5	NR	2 - 5	2 - 5	NR
Oats	2 - 5	NR	NR	2 - 5	2 - 5	NR
Red fescue (seedling)	5 cm tall	5 cm tall	NR	NR	NR	NR
(established)	Up to flag leaf	Up to flag leaf	NR	NR	NR	NR
Seedling grasses	2 - 4	2 - 4	NR	2 - 4	2 - 4	NR
Spring rye	2 - 3	2 - 3	NR	NR	NR	NR
Spring wheat	2 - 5	2 - 5	2 - 5	2 - 5	2 - 5	2 - 3
Winter wheat	15 - 25 cm	15 - 25 cm	NR	15 - 25 cm	15 - 25 cm	NR

* NR – Not Registered.
** Do not use surfactant.

7. How to Apply:

With: Aircraft or ground equipment.

Water volume: Air: 8 L/ac minimum. Ground: Cereals, seed grasses: 45 L/ac. Corn: 90 - 140 L/ac. Summerfallow/stubble (thistles): 45 - 90 L/ac. Reduced tillage: 20 - 40 L/ac. Pastures, rangeland grasses: 45 - 90 L/ac. Preseeding application prior to direct seeding: 40 L/ac.

Pressure: Air: not above 200 kPa. Ground: 275 kPa.

Nozzles: Flat fan recommended.

Rate:

Air: (Banvel II + phenoxy mixes only). Apply only 95 mL/ac of Banvel II by air.

Ground: See table.

	Banvel II 480 g/L Formulation					
Crop	**Banvel II alone mL/ac**	**Banvel II + 2,4-D Amine 500 mL/ac + mL/ac**	**Banvel II + Ally mL/ac + g/ac**	**Banvel II + MCPA Amine 500 mL/ac + mL/ac**	**Banvel II + MCPA K 400 mL/ac + mL/ac**	**Banvel II + Metribuzin (Sencor or Lexone DF) mL/ac + (mL/ac or g/ac)**
Barley	95	95 + 340	95 + 2	95 + 340	95 + 445	95 + 110 - 170 or 110
Canary seed	115	NR*	NR	115 + 340	NR	NR
Durum wheat, winter wheat	95 - 115	95 - 115 + 340	NR	95 - 115 + 340	95 - 115 + 445	NR
Field corn	245 - 500	115 + 340	NR	NR	NR	NR
Oats	95 - 115	NR	NR	95 - 115 + 340	95 - 115 + 445	NR
Red fescue	245	245 + 600	NR	NR	NR	NR
Seedling grasses	95 - 115	95 - 115 + 340	NR	95 - 115 + 340	95 - 115 + 445	NR
Spring rye	95 - 115	95 - 115 + 340	NR	NR	NR	NR
Spring wheat	95 - 115	95 - 115 + 340	95 + 2	95 - 115 + 340	95 - 115 + 445	95 + 110 - 170 or 110

* NR – Not Registered.

Other uses	**Banvel II alone L/ac**	**Banvel II + 2,4-D Amine 500 rate/ac**	**Banvel II + 2,4-D LV Ester 600 rate/ac**	**Banvel II + Roundup + non-ionic surfactant mL/ac**
Fallow (thistle rosette)	0.5 L	NR	NR	NR
Fallow/stubble (thistles)	1.0 L	NR	NR	510 + 690 + 142
Reduced tillage	NR	95 - 115 mL + 445 mL	95 - 115 mL + 370 mL	(115 - 245) + (305 - 400) + 142
Pastures/range (brush)	NR	2.1 L + 4.0 L in 1,000 L water	2.1 L + 3.3 L in 1,000 L water	NR
Pastures/range (weeds)	0.67 L - 1.9 L	0.67 L + 0.90 L	0.67 L + 0.75 L	NR
Pastures (volunteer alfalfa)	NR	240 mL + 600 mL	NR	NR
Pre-seeding (direct seeding)	NR	NR	NR	125 + 375 + 0.5% v/v

Brush species	**Broadcast application of Banvel II + 2,4-D in 90 - 130 L/ac of water**
Aspen poplar	1.3 L/ac + 1.7 L/ac 2,4-D Amine 500 or 1.5 L/ac 2,4-D Ester 600
Western snowberry	1.5 L/ac + 1.5 L/ac 2,4-D Ester 600
Wild rose	1.5 L/ac + 1.7 L/ac 2,4-D Amine 500 or 1.5 L/ac 2,4-D Ester 600

* NR – Not Registered.

Banvell II (cont'd)

8. **Application Tips:** Best when crop is under good growing conditions and air temperature 10 - 25°C. Avoid application when crop is under stress from adverse environmental conditions. Do not spray if risk of frost or severe drop in night temperature is forecast. Do not use on bentgrass. Apply only at recommended crop stage otherwise crop damage can occur.
9. **How it Works:** Absorbed through roots and leaves and translocated in phloem and xylem, disrupting the metabolism.
10. **Expected Results:**

    Weeds: Results may take 10 - 14 days to appear. Proliferation of tissues in plant causes twisting, bending of stem and leaf petioles; cupping of leaves; increase in root size; increase in fibrous roots.

    Crops: Shortening of straw may occur in treated crops without adverse affects on yield. If applied at other than recommended crop stage, head and stem deformities may occur. Crops under stress from adverse environmental conditions may suffer a further setback. Crop injury may be offset by weed control obtained. **Poor results may be expected if** it rains within 4 hours, older weeds are sprayed or insufficient water.
11. **Effects of Rainfall:** Rainfall more than 4 hours after application will not reduce effectiveness.
12. **Movement in Soil:** Dicamba is more subject to leaching in sandy soils than in clay textured soils. During the growing season, the half-life of dicamba is less than 30 days.
13. **Cropping Restrictions:**

    Succeeding crops: When Banvel II is applied at 1.0 L/ac on fallow or stubble. Grow only beans (white), cereals, corn (field, sweet) or soybeans the next year. After Banvel II (510 mL/ac) + Roundup (690 mL/ac) for thistle control, grow only beans (white), cereals, corn (field, sweet), rapeseed or soybeans. If application is after September 1 or if soil is dry subsequent to application, crop injury may occur next spring.

    Drift: Can harm ornamentals and other desirable plants.

    Grazing restrictions:

    Canary seed: Use seed only as bird seed.

    Cereals, seedling grasses: Follow as per grazing and haying restrictions.

    Corn: Do not graze or harvest for silage until 7 days after Banvel II alone or Banvel II + 2,4-D Amine; at least 12 weeks after other tank mixes.

    Pastures, rangeland, non-crop area (meat animals): If treated vegetation has been consumed by meat animals within 30 days of Banvel II application, feed the animal with untreated diet for 30 days before slaughter. Meat animals may graze or feed on treated pasture 30 days after Banvel II application without restrictions on slaughter.

    Grazing and hay restrictions (dairy cattle): (Days = time between treatment and grazing or cutting.) Up to 500 mL/ac: 0 days, 501 - 930 mL/ac: 7 days, 931 mL/ac - 1.86 L/ac: 14 days, 1.87 - 2.87 L/ac: 30 days.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = formulated 2,629 mg/kg. May cause mild skin irritation and extreme eye irritation and swelling. Non-toxic to fish and birds.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** If frozen, shake thoroughly before use. No activity is lost if completely resuspended.
17. **Resistance Management:** Banvel II is a Group 4 herbicide. Any weed population may contain plants naturally resistant to Banvel II and other Group 4 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Basagran *(bentazon)*

Group 6

Manufacturer: **BASF Canada**

CAUTION POISON

1. **Formulations:** Liquid; 480 g/L; 2 x 9 L.
2. **Registered Mixes:** Basagran: Spring wheat only: 2,4-D 500 Amine or Ester.

   Surfactants: Assist Oil Concentrate (all crops), Citowett Plus (processing peas), Super Spreader.
3. **Crops:**

   alfalfa[a,c]
   alsike clover[a]
   black beans
   blueberry
   bromegrass[b]
   creeping red fescue[b]
   crested wheatgrass[b]
   dry beans (8.1)
   fababeans (8.6)
   field corn (8.8)
   field peas (8.5)
   flax (8.8) (including low linolenic acid varieties)
   kidney beans
   lima beans
   linola
   meadow foxtail[b]
   orchard grass[b]
   pinto beans
   processing peas (8.3)
   red clover[a]
   sainfoin[a,c]
   seed corn (8.8)
   silage corn (8.8)
   snap beans (8.1)
   snow peas
   soybeans
   spring wheat (including underseeded to forage crops listed)
   sweet clover[c]
   sweet corn (8.8)
   timothy[b]
   white beans

   [a] Seedling legumes for seed production only.
   [b] Seedling grasses for seed production only.
   [c] Established stand for seed production.
4. **Weeds Controlled:**

   annual smartweed (7.0)
   bird rape*
   buttercup
   cleavers
   cocklebur
   common chickweed (7.2)
   common groundsel (8.5)*
   common ragweed*
   corn spurry (7.0)
   giant ragweed*
   hairy galinsoga
   hairy nightshade (6.0)
   lady's-thumb
   lamb's-quarters (6.2)*
   low cudweed
   purslane
   redroot pigweed (7.2)*
   Russian thistle (7.9)
   shepherd's-purse (7.3)
   stinkweed (7.8)
   stork's-bill
   volunteer canola
   wild mustard (8.4)
   wild radish

   * Triazine resistant strains of these weeds are controlled by Basagran.
5. **Weeds Suppressed:** Canada thistle** (single application)(4.7), field bindweed*, Russian thistle.

   * Treat field bindweed before it is dark green and has begun to trail.
   ** Repeat application may be required for control.
6. **When Used:**

   Beans (dry, kidney, lima, snap, white): 1 - 3 trifoliate leaves.

   Corn: 1 - 5 leaf.

   Fababeans: Soon after 3 leaf stage.

   Flax: Soon after crop reaches 5 cm.

   Peas (field, processing): Soon after 3 pair of leaves form.

   Soybeans: Unifoliate – 2 expanded trifoliate leaves, usually 18 - 28 day after planting.

   Spring wheat: Tolerant at any growth stage.

   Seedling forage legumes (alfalfa, red clover, alsike clover, sainfoin): Tolerant after 3rd trifoliate stage.

   Seedling forage grasses: Tolerant at 1 - 7 leaf stage.

   Established forage legumes (Alfalfa, tolerant before crop canopy closes, prior to flowering).

   Sainfoin, clover: Tolerant between 7.5 - 25 cm height.

Basagran (cont'd)

7. **How to Apply:**

With: Aircraft (Basagran and Assist only) or ground equipment.

Rate:

Basagran:

910 mL/ac: All crops/weeds listed.

710 mL/ac: For control of cocklebur, lady's-thumb, wild mustard, bird rape, stinkweed or shepherd's-purse only. For Canada thistle suppression, repeat applications 7 - 15 days after application if necessary.

400 mL/ac: For spring wheat (not underseeded) only when tank mixed with 2,4-D Amine or Ester (470 g/L) at 300 - 400 mL/ac. This tank mix will control lady's-thumb, bluebur, burdock (<4 leaf), cocklebur, common plantain, flixweed, lamb's-quarters, mustard (except dog and tansy), prickly lettuce, redroot pigweed, Russian thistle, shepherd's-purse, stinkweed, sweet clover, volunteer canola, wild radish and wild sunflower. Application should be made at the 2 - 4 leaf stage of these weeds.

Assist: Ground: Add 400 mL of Assist per 40 litres of water with a maximum rate of 810 mL/ac. Reduce Assist to 400 mL/ac under hot, humid conditions. Air: Add 50 - 100 mL/ac of Assist. Do not use Assist in excess of 100 mL/ac as substantial crop injury could occur.

Water volume: Air: 20 - 40 L/ac. Ground: 40 - 160 L/ac.

Pressure: Air: 275 kPa minimum. Ground: 275 - 425 kPa.

Nozzles: Flat fan or hollow cone only recommended. Tilt 45° forward to ensure better coverage.

Note: Basagran Forte is not registered for aerial applicaiton.

8. **Application Tips:** Do not apply to crops that have been stressed (e.g. hail damage, flooding, drought, widely fluctuating temperatures, prolonged cold weather). Best results are when weeds are young and actively growing. Apply Basagran when broadleaf weeds are small and actively growing and before the weeds reach the maximum size recommended for treatment. Apply Basagran to stork's-bill at the 2 - 6 leaf stage and to cleavers at the 1 - 3 whorl stage. Basagran should be applied when the main weed of concern is in the suggested growth stage for treatment.

Band spraying: Spray minimum of 25 cm wide band. Minimize the amount of dust striking target weeds to ensure adequate coverage and penetration. Do not use cultivation equipment when spraying. Adjust the Basagran rate to proportion of the total area to be sprayed.

9. **How it Works:** Contact herbicide which interferes with photosynthesis. In resistant plants, metabolized to a non-toxic material. Uptake into the plant occurs primarily through the leaves. Thorough coverage of foliage is important for consistent weed control.

10. **Expected Results:**

Weeds: Weeds turn yellow initially and then brown, usually within 2 weeks.

Crops: Yellowing, bronzing, speckling or burning occurs sometimes. The crop usually outgrows the condition within 10 days. **Poor results may be expected when** weeds are beyond recommended growth stage, when spray coverage is poor or under poor growing conditions (cool weather conditions or drought).

11. **Effects of Rainfall:** Rainfall within 6 - 8 hours of application may reduce activity.

12. **Movement in Soil:** Bentazon is not adsorbed to soil particles but is rapidly incorporated into the soil organic matter by microorganisms. Does not leach below plow layer.

13. **Cropping Restrictions:**

Drift: Avoid drift onto susceptible crops such as adzuki and mung beans, cucumbers, lentils, mustard, rapeseed, sugar beets and sunflowers.

Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

Succeeding crops: No restrictions.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 1,100 mg/kg. Slightly toxic to fish. Non-toxic to birds and bees.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a heated place, freezing will not affect activity. If frozen, warm to room temperature and shake well.
17. **Resistance Management:** Basagran is a Group 6 herbicide. Any weed population may contain plants naturally resistant to Basagran/Basagran Forte and other Group 6 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Basagran Forte *(bentazon)*

Group 6

Manufacturer: BASF Canada

1. **Formulations:** Liquid; 480 g/L; 2 x 10 L.
2. **Registered Mixes:** None
3. **Crops:** Dry bean, kidney bean, white bean, grain corn, silage corn, sweet corn, seed corn), flax (including low linolenic acid), forages, field peas, processing peas, soybeans, fababeans.
4. **Weeds Controlled:**

annual smartweed (7.0)
bird rape*
buttercup
cleavers
cocklebur
common chickweed (7.2)
common groundsel (8.5)*
common ragweed*
corn spurry (7.0)
giant ragweed*
hairy galinsoga
hairy nightshade (6.0)
lady's-thumb
lamb's-quarters (6.2)*
low cudweed
purslane
shepherd's-purse (7.3)
stinkweed (7.8)
wild mustard (8.4)
wild radish

* Triazine resistant strains of these weeds are controlled by Basagran Forte.

5. **Weeds Suppressed:** Canada thistle (4.7), field bindweed*, redroot pigweed, Russian thistle.

   * Treat field bindweed before it is dark green and has begun to trail.
6. **When Used:**

   Beans (dry, kidney, white): 1 - 3 trifoliate leaves.

   Corn: 1 - 5 leaf.

   Forages: 3 – 8 leaf stage before closure of crop canopy.

   Flax: Soon after crop reaches 5 cm.

   Peas (field, processing): Soon after 3 pair of leaves form.

   Soybeans: Unifoliate – 2 expanded trifoliate leaves, usually 18 - 28 day after planting.

   Fababeans: Soon after 3 leaf stage.

Basagran Forte (cont'd)

7. **How to Apply:**

   With: Ground equipment.

   Rate: 910 mL/ac: All crops/weeds listed.

   710 mL/ac: For control of cocklebur, lady's-thumb, wild mustard, bird rape, stinkweed or shepherd's-purse only. For Canada thistle suppression, repeat applications 7 - 15 days after application if necessary.

   Water volume: 40 - 160 L/ac.

   Pressure: 275 - 425 kPa.

   Nozzles: Flat fan or hollow cone only recommended. Tilt 45° forward to ensure better coverage.

   Note: Basagran Forte is not registered for aerial applicaiton.

8. **Application Tips:** Do not apply to crops that have been stressed (e.g. hail damage, flooding, drought, widely fluctuating temperatures, prolonged cold weather). Best results are when weeds are young and actively growing. Apply Basagran Forte when broadleaf weeds are small and actively growing and before the weeds reach the maximum size recommended for treatment. Basagran Forte to cleavers at the 1 - 3 whorl stage. Basagran should be applied when the main weed of concern is in the suggested growth stage for treatment.

9. **How it Works:** Contact herbicide which interferes with photosynthesis. In resistant plants, metabolized to a non-toxic material. Uptake into the plant occurs primarily through the leaves. Thorough coverage of foliage is important for consistent weed control.

10. **Expected Results:**

    Weeds: Weeds turn yellow initially and then brown, usually within 2 weeks.

    Crops: Yellowing, bronzing, speckling or burning occurs sometimes. The crop usually outgrows the condition within 10 days. **Poor results may be expected when** weeds are beyond recommended growth stage, when spray coverage is poor or under poor growing conditions (cool weather conditions or drought).

11. **Effects of Rainfall:** Rainfall within 6 - 8 hours of application may reduce activity.

12. **Movement in Soil:** Bentazon is not adsorbed to soil particles but is rapidly incorporated into the soil organic matter by microorganisms. Does not leach below plow layer.

13. **Cropping Restrictions:**

    Drift: Avoid drift onto susceptible crops such as adzuki and mung beans, cucumbers, lentils, mustard, rapeseed, sugar beets and sunflowers.

    Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

    Succeeding crops: No restrictions.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 1,100 mg/kg. Slightly toxic to fish. Non-toxic to birds and bees.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a heated place, freezing will not affect activity. If frozen, warm to room temperature and shake well.

17. **Resistance Management:** Basagran Forte is a Group 6 herbicide. Any weed population may contain plants naturally resistant to Basagran Forte and other Group 6 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Betamix *(phenmedipham + desmedipham)*

Group 5

Manufacturer: Bayer CropScience

1. **Formulations:** Emulsifiable concentrate: 75 g/L phenmedipham + 75 g/L desmedipham; 10 L bottle.
2. **Registered Mixes:** Herbicide 273.
3. **Crops:** Sugar beet.
4. **Weeds Controlled:**

green foxtail
kochia
lamb's-quarters
mustard
nightshade
ragweed
redroot pigweed
stinkweed
wild buckwheat
yellow foxtail

5. **Weeds Suppressed:** None.
6. **When Used:** Early post-emergence when weeds are early cotyledon to 4 leaves. Do not commence spray application until mid-afternoon.
7. **How to Apply:**

   With: Ground equipment as a band or broadcast treatment.

   Rate: 1.0 - 4.45 L/ac broadcast equivalent in a maximum of 42 litres of water for each litre of Betamix. Use low rate on early cotyledon beets and high rate on beets with at least 4 fully expanded leaves. Repeat application for improved weed control.
8. **Application Tips:** Avoid spraying until mid-afternoon when daytime temperatures will exceed 22°C. High humidity increases efficacy. Best results are obtained with repeat applications of the lowest rate commencing when the first weeds emerge.
9. **How it Works:** Absorbed through leaves. Sharply inhibits rate of assimilation of CO_2 in treated plants within 6 hours. Resistant species (sugar beets) begin recovery in this time while susceptible species do not.
10. **Expected Results:** Under warm conditions, weed kill is complete in 4 - 7 days. Cool conditions require longer periods of up to 2 weeks.
11. **Effects of Rainfall:** Rainfall within 6 hours of application may reduce weed kill.
12. **Movement in Soil:** Very little leaching occurs.
13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.
14. **Toxicity:** Acute oral LD_{50} phenmedipham (rat) = 8,000 mg/kg. Acute dermal LD_{50} phenmedipham (rat) = 4,000 mg/kg. Acute oral LD_{50} desmedipham (rat) = >10,250 mg/kg. Toxic to fish - avoid contamination of water supply.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Do not store below 0°C.

Betamix (cont'd)

17. **Resistance Management:** Betamix is a Group 5 herbicide. Any weed population may contain plants naturally resistant to Betamix and other Group 5 herbicides. The resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Buctril M/Mextrol/Badge

(bromoxynil + MCPA)

Group 6,4

Manufacturer: Bayer CropScience/Nufarm Canada/United Agri Products

WARNING POISON

1. **Formulations:** Emulsifiable concentrate; Buctril M: 280 g/L bromoxynil + 280 g/L MCPA; 8 L jugs, 113 L.
   Mextrol: 200 g/L bromoxynil + 200 g/L MCPA; 11.36 L jugs.
   Badge: 225 g/L bromoxynil + 225 g/L MCPA; 10 L jug.
2. **Registered Mixes: Spring wheat, durum wheat, winter wheat:** Accord*, Accord and Avenge*, Achieve Liquid*, Ally, Avenge, Horizon, MCPA Amine, Ester, K-salt, Puma^{120} Super*, Refine Extra*, Puma^{120} Super + Refine Extra*. **Barley:** Achieve Liquid*, Ally, Avenge, MCPA Amine, Ester, K-salt, Puma^{120} Super*, Refine Extra*, Puma^{120} Super + Refine Extra*. **Oats:** MCPA Amine, Ester, K-salt. **Flax:** Fusion, Poast Ultra, Select. **Low linolenic acid flax varieties:** Fusion*, Select. **Corn:** Atrazine.

   * Buctril M only.

   Mixing restrictions: Ally: add 1/2 amount of water to tank, add Ally, agitate, add rest of water, add Buctril M/Mextrol and then surfactant. Atrazine: add Atrazine (450 - 910 g active/ac) to tank first. Do not add oil or surfactant. Observe precautions and limitations of both labels. TCA: Prepare Buctril M/Mextrol mix, then add TCA. Avenge: add 1/2 of the water, add Buctril M/Mextrol, add rest of water, add Avenge. MCPA: add 1/2 of the water, add MCPA, agitate, add rest of water, add Buctril M/Mextrol.
   Achieve Liquid: Refer to Achieve Liquid write-up for mixing instructions. Select: Prepare Buctril M/Mextrol mix, then add Select plus Amigo. Horizon: add Buctril M/Mextrol, then add Horizon, then add Score. Puma^{120} Super: add Buctril M/Mextrol, then add Puma^{120} Super.
3. **Crops:**

barley (8.8)
canary seed (8.5)
durum wheat (8.6)
fall rye
field corn (9.0)
flax (8.4)
oats (8.8)
solin (low linolenic flax)
spring wheat (8.6)
sweet corn (9.0)
winter wheat (8.8)
(fall or spring applied)

Seedling grasses (for seed)

bromegrass (8.9)
creeping red fescue (8.7)
crested wheatgrass (8.5)
intermediate wheatgrass (8.5)
meadow fescue (8.3)
meadow foxtail
orchard grass (8.9)
reed canary grass
Russian wild ryegrass (9.0)
slender wheatgrass (8.5)
tall fescue
tall wheatgrass (8.5)
timothy (8.5)

Established grasses

timothy (for seed or hay)

Underseeding: Legumes not recommended.

4. Weeds Controlled:

American nightshade
ball mustard
bluebur
cocklebur
common buckwheat
common groundsel
common ragweed
cow cockle (7.8)
flixweed (5.7)
green smartweed
kochia (6.7)
lady's-thumb
lamb's-quarters (8.6)
night-flowering catchfly (7.8)
pale smartweed (8.2)
redroot pigweed (7.9) (except flax)
Russian thistle (7.1)
scentless chamomile (7.2) (seedlings only)
shepherd's-purse (6.0)
stinkweed (8.9)
tartary buckwheat (8.5)
volunteer rapeseed (8.7)
volunteer sunflower
wild buckwheat (8.1)
wild mustard (8.4)
wild tomato
wormseed mustard

5. Weeds Suppressed: Canada thistle (4.9), perennial sow-thistle.

6. When Used:

Crop stage:

Barley, oats and wheat: 2 leaf to early flag leaf.

Winter wheat, fall rye: 2 - 4 leaf in the fall or after growth begins in the spring, but prior to flag leaf. Canary seed: 3 - 5 leaf. Flax: 5 - 10 cm. Corn: 4 - 6 leaf.

Seedling grasses: 2 - 4 leaf (establishment year only, not underseeded to legumes).

Established timothy (for hay): 3 - 6 leaf stage.

Weed stage:

Weeds controlled up to 4 leaf stage: American nightshade, bluebur, ball mustard, cocklebur, cow cockle*, flixweed, green smartweed, lady's-thumb, night flowering catchfly, redroot pigweed, Russian thistle**, scentless chamomile***, shepherd's-purse, volunteer rapeseed, volunteer sunflower.

Weeds controlled up to 8 leaf stage: Canada thistle (top growth), common buckwheat, common groundsel, common ragweed, lamb's-quarters, pale smartweed (seedlings), perennial sow-thistle (top growth), stinkweed, tartary buckwheat, wild buckwheat, wild mustard, wild tomatos (up to 6 leaf stage) wormseed mustard.

* In normal conditions, cow cockle will be controlled up to the 4 leaf stage. Plants beyond this stage are unlikely to be controlled.

** Spray before plants are 5 cm high.

*** Spring annuals only.

7. How to Apply:

With: Aircraft (wheat, barley and oats only) or ground equipment.

Rate: 400 mL/ac (Buctril M); 567 mL/ac (Mextrol); 500 mL/ac (Badge).

Water volume: Air: 8 L/ac or more. Ground: 20 L/ac or more. Corn: 80 - 120 L/ac. Seedling grasses: 60 L/ac; Established timothy: 60 L/ac.

Pressure: 275 kPa.

Nozzles: Flat fan recommended. Hollow cone (air only).

8. Application Tips: Avoid spraying during a severe drought. Under conditions of high temperature and humidity, slight discolouration of cereals may occur but no effect on crop yields. Flax is less tolerant than cereals; therefore, do not spray flax in hot humid weather when daytime temperatures are over 25 - 29°C. Best results are achieved when weeds are sprayed in seedling stage, with good spray coverage. Corn: Buctril M at 400 mL/ac (or Mextrol at 567 ml/ac) as an overall spray only up to 6 leaf stage. Buctril M + Atrazine (or Mextrol + Atrazine) for a broader spectrum of weed control. Cultivation after application is not recommended.

9. How it Works: Bromoxynil is a contact type herbicide; therefore, good spray coverage is essential. Inhibits photosynthesis and plant respiration. MCPA is absorbed through leaves and is readily translocated in the plant.

10. Expected Results: Small burnt spots on the leaf can appear within hours, death takes up to 2 weeks. **Poor results may be expected if** poor coverage. Poor penetration through crop canopy.

Buctril M/Mextrol/Badge (cont'd)

11. **Effects of Rainfall:** No effect.
12. **Movement in Soil:** Readily leached from soil. Longer residual in dry soil.
13. **Cropping Restrictions:**

    Succeeding crops: No restrictions.

    Grazing restrictions: Do not graze or harvest for greenfeed until 30 days after treatment.
14. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = 365 mg/kg. Very toxic to fish and birds. Non-toxic to bees. May cause burns and may be absorbed through the skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Buctril M formulations will solidify at temperatures below -20°C but will become useable at temperatures above 0°C.
17. **Resistance Management:** Buctril M/Mextrol/Badge is both a Group 4 and a Group 6 herbicide. Any weed population may contain or develop plants naturally resistant to Buctril M/Mextrol and other Group 4 and 6 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Calmix Pellets *(bromacil + 2,4-D)*

Group 5,4

Manufacturer: **Nufarm Canada/United Agri Products**

CAUTION POISON

1. **Formulations:** Calmix Pellets; 3.0% bromacil + 5% 2,4-D; 1 kg, 5 kg bags.
2. **Registered Mixes:** None.
3. **Crops:** Non-crop areas only.
4. **Weeds Controlled:** Non-selective.
5. **Weeds Suppressed:** Not applicable.
6. **When Used:** May be applied during the growing season, but to prevent growth, apply in fall or early spring.
7. **How to Apply:**

   With: Calmix spreader or shaker.

   Rate: Apply higher rate to heavier soils and/or to extend the growth control period.

Weeds	Calmix Pellets kg/100 m^2
Annual weeds and perennial seedlings	2.5
Heavy perennial growth	5.0
Shallow-rooted perennials	3.75

Spot treatment Calmix: 37.5 g to about 1 m^2. Repeat treatment when required. Around utility poles, treat 1.25 m around each pole, 250 g Calmix/pole.

8. **Application Tips:** Do not use near lawns or flower beds. **Do not apply closer than 1.5 times the height of nearby trees.** Roots from large trees may extend well beyond the height of the tree and may extend beneath areas to be treated. Be cautious where trees are in close proximity to the treatment site. Do not apply on slopes where water erosion may carry chemical onto areas of desirable vegetation. Do not contaminate water used for irrigation or other domestic uses.
9. **How it Works:** Systemic action, enters plant via roots.
10. **Expected Results:** Vegetation turns brown and dies. No new growth will appear, resulting in bare ground. Rapidity and duration of control will depend upon amount of chemical applied, soil type and environmental conditions. **Poor results may be expected if** inadequate application rates, soil erosion removes chemical from treated area when applied on slopes or insufficient rainfall to activate chemical.
11. **Effects of Rainfall:** Moisture will activate and carry the herbicide into the root zone.
12. **Movement in Soil:** Once fixed in the soil, there is very little lateral movement. Pellets and granular can be carried by erosion.
13. **Cropping Restrictions:** Use on non-crop areas only.

    Grazing restrictions: Use on non-crop areas only.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = bromacil 5,200 mg/kg; 2,4-D = 375 mg/kg. Slightly toxic to fish. Non-toxic to birds. May cause burns and may be absorbed through the skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in dry area.

Casoron *(dichlobenil)*

Manufacturer: **United Agri Products**

Group 20

1. **Formulations:** Granular; 4%; 2 kg, 3 kg shaker jug, 15 kg bag.
2. **Registered Mixes:** None.
3. **Crops:**

arbor vitae
ash
caragana shelterbelts
crabapple
cutleaf weeping birch
established fruit trees*
honeysuckle
juniper
lilac
linden
maple
non-crop areas
raspberries
roses
saskatoons
white cedar
willow

* Apple, cherry, peach, pear, plum at least 1 year old.

Casoron (cont'd)

4. **Weeds Controlled:**

annual bluegrass
artemisia*
bindweed*
Canada thistle*
chickweed
dandelion*
foxtail
groundsel
horsetail
knotweed
kochia
lamb's-quarters
mustard
pigweed
plantain
purple loosestrife
purslane
quackgrass*
shepherd's-purse
smartweeds
sow-thistle
spurge
vetch*
wild buckwheat*

* Controlled with higher rates with late fall application.

5. **Weeds Suppressed:** None.

6. **When Used:** For best results apply when soil temperatures are cool.

Annual weeds: Apply to prepared weed-free soil either in early spring before seeds of annuals germinate or after cultivation has removed weeds. Do not apply until 4 weeks after transplanting tolerant crops.

Perennial weeds: Apply in fall (October 15 until soil freeze-up) on crops established for at least 1 year. Quackgrass and artemisia in established woody ornamentals, apply in fall and again in the early spring before May 1.

Raspberries: Apply in late fall but before soil freeze-up. Do not cultivate or work into the soil. Do not apply in spring as injury may occur.

7. **How to Apply:**

With: Ground granular applicator.

Rate: Annual weeds: 45 - 70 kg/ac, based on area actually treated.

Quackgrass, artemisia in woody ornamentals: 60 kg/ac in fall; 60 kg/ac again in spring.

Quackgrass, thistles, bindweed in woody ornamentals: 91 - 111 kg/ac.

Raspberries: 71 kg/ac.

8. **Application Tips:** Do not use on light sandy soils with less than 2% organic matter. Do not use on firs, hemlock, spruce, Mugho pine or on herbaceous perennials. Do not use in seedbeds, transplant, or cutting beds or in greenhouses. Do not apply until 6 months after rooting of cuttings in the field.

9. **How it Works:** Snow melt or rain moves Casoron into the soil. Casoron inhibits germination but acts primarily on growing points and root tips.

10. **Expected Results:** Growth of emerging shoots of some perennials controlled. Tolerant crops are unaffected if roots do not come in contact with Casoron in the upper layers of the soil.

11. **Effects of Rainfall:** If it is dry, poor results can be expected.

12. **Movement in Soil:** Some movement in coarse-textured soils.

13. **Cropping Restrictions:** Do not transplant into treated soil for 1 year. Do not plant vegetables or other sensitive crops the year following treatment.

Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

14. **Toxicity:** Very low mammalian toxicity. Acute oral LD_{50} (rats) = 3,160 mg/kg. Slightly toxic to fish.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Dry storage – not affected by frost.

Champion Extra *(fenoxaprop-p-ethyl + thifensulfuron methyl + tribenuron methyl)*

Group 1,2

Manufacturer: **DuPont Canada Inc.**

CAUTION POISON

1. **Formulations:**
   1. Extra: Dry flowable; 50% thifensulfuron methyl, 25% tribenuron methyl; 2 x 162 gram containers.
   2. Champion: Emulsifiable concentrate; 92 g/L. fenoxaprop-p-ethyl.; 2 x 8.1 L jugs.
2. **Registered Mixes:** MCPA Ester 500 (340 mL/ac).
3. **Crops:** Barley (all spring varieties).
4. **Weeds Controlled:**

Champion Extra

barnyard grass
ball mustard
chickweed (8.5)
common groundsel
corn spurry (8.8)
cow cockle (8.7)
flixweed
green foxtail
green smartweed
hemp-nettle (8.4)
kochia (7.8)
lady's-thumb
lamb's-quarters (8.6)
narrow-leaved hawk's-beard
redroot pigweed (8.4)
Russian thistle (7.9)
shepherd's-purse (8.2)
stinkweed (8.6)
tartary buckwheat (8.3)
volunteer rapeseed (8.6) (excluding CLEARFIELD)
volunteer sunflower
wild buckwheat (7.7)
wild mustard (8.5)
wild oats

Champion Extra + MCPA

Refer to MCPA Ester label for additional weeds controlled.

5. **Weeds Suppressed:** Canada thistle (7.1), cleavers (6.7), round-leaved mallow (6.4), scentless chamomile (6.9), sow-thistle, stork's-bill (6.7), toadflax (less than 15 cm tall)(7.1).
6. **When Used:**

Crop stage: For optimum crop safety, apply at the 3 - 4 leaf stage of barley. However, Champion Extra may be applied to barley at the 2 - 5 leaf stage on the main stem with no more than 2 tillers. The 2 tiller stage of barley usually occurs within 25 days after seeding.

Weed stage: Barnyard grass, green foxtail and wild oats: 1 - 6 leaf stage, prior to the emergence of the 3rd tiller.

Broadleaf weeds: Apply to young, actively growing broadleaf weeds before the canopy closes. Weeds emerging after treatment may not be controlled.

Wild buckwheat: 1 - 3 leaf stage.

Cleavers: Apply at 1 - 3 whorl stage.

Canada thistle, sow-thistle: Up to 15 cm tall, apply when the majority of the thistles have emerged and are actively growing. A single application will effectively inhibit the ability of emerged thistles to compete with the crop. Later emerging thistles will not be controlled.

Chickweed: 1 - 6 leaf stage and actively growing. Chickweed emerging after application will not be controlled.

Round-leaved mallow: 2 - 6 leaf stage (10 - 12 cm in height).

Toadflax: up to 15 cm in height. A control program for this weed includes both frequent tillage and chemical application.

Volunteer rapeseed: Champion Extra alone will not control CLEARFIELD canola.

7. **How to Apply:**

With: Ground equipment. Do not apply by air.

Rate: Champion: 405 mL/ac, Extra: 8 g/ac.

Champion Extra (cont'd)

Water volume: 40 L/ac.

Pressure: Ground 275 kPa.

Nozzles: The use of 80 or 110 flat fan nozzles is recommended for optimum spray coverage.

Mixing instructions:

1. Ensure that the spray tank, lines and filter are thoroughly clean.
2. Fill the spray tank half full with clean water and start agitation or bypass system.
3. Add the required amount of Extra (container #1) while maintaining agitation until Extra is completely in suspension. Use all containers of Extra, if using more than one container.
4. Add the correct amount of Champion (container #2) and continue agitation. Use all containers of Champion, if using more than one container.
5. Triple rinse the emptied containers into the spray tank.
6. Add the remaining amount of water while agitation continues.
7. On repeat loads, ensure that the amount of spray solution left in the spray tank from the previous load is less than 10% of the volume to be mixed.
8. Spray out immediately. Spray mixture should not be left in the tank overnight. If spray solution is left standing without agitation, thoroughly agitate and re-suspend any settled Champion Extra tank mix before resuming the spraying operation.
9. **Do not** tank mix with any other chemical additives, pesticides, **Surfactants** or fertilizers.

Sprayer cleanup: To avoid injury to susceptible crops, thoroughly clean sprayer immediately after spraying. Ammonia must be used to deactivate Champion Extra when cleaning.

1. Drain and flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to ensure removal of all visible residues of Champion Extra. If necessary, repeat step 1.
2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum of 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, then add more water and ammonia to completely fill tank so that all surfaces are in contact with the solution. Allow to sit for 15 minutes with agitation. Again, flush the hoses booms and nozzles with the cleaning solution and drain the tank.
3. Remove nozzles and screens, and clean separately in bucket containing cleaning agent and water.
4. Repeat step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips**: Reduced control may result during periods of stress when plants are not actively growing, or when daytime temperatures – before or following application – are very hot combined with very dry conditions and low humidity, or when plants are under stress. **Do not** apply to crop that is stressed by severe weather conditions, frost, low fertility, drought, water saturated soil, disease or insect damage as crop injury may result. A time interval of 7 days prior to application or 4 days after application of Champion Extra tank mix is required before any other pesticide can be applied.

9. **How it Works**:

Fenoxaprop-p-ethyl: Contact as well as systemic, no soil activity. Regions of high meristematic activity such as root and shoot tips are known to be affected.

Thifensulfuron and Tribenuron: Absorbed by foliage. Inhibits cell elongation.

10. **Expected Results**:

Grassy weeds: Reduction of leaf growth and chlorotic blotching within 1 - 3 days after application. Initial development of leaf chlorosis within 5 - 8 days after application and complete death within 14 - 21 days after application.

Broadleaf weeds: Growth stops almost immediately. Discolouration of dying weeds may not be noticeable for 1 - 3 weeks after application, depending on growing conditions and weed susceptibility. **Poor results may be expected if** there is improper mixing, timing or coverage, or when weeds are under drought stress.

11. **Effects of Rainfall:** Rainfall within 4 hours of application may lessen degree of weed control.
12. **Movement in Soil:** Fenoxaprop-p-ethyl appears to undergo rapid hydrolysis in the soil. Thifensulfuron and Tribenuron move very little in the soil and have a very short life in the soil.
13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze the treated crops or cut for hay; sufficient data is not available to support such use. Pre-harvest interval: 50 days. Do not exceed a total of 8 grams/acre of Extra per crop year.
14. **Toxicity:**

    Fenoxaprop-p-ethyl: Acute oral LD_{50} (rat) = >2,940 mg/kg.

    Thifensulfuron and Tribenuron: Low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention
16. **Storage:** Store product in closed, original container in a cool, dry, well ventilated room.
17. **Resistance Management:** Champion Extra is both a Group 1 and a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Champion Extra and other Group 1 and 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Champion Plus *(fenoxaprop-p-ethyl + MCPA + 2,4-D + thifensulfuron methyl)*

Group 1,4,2

Manufacturer: DuPont Canada Inc.

CAUTION POISON

1. **Formulations:**
    1. Champion FM: Emulsifiable concentrate; 45 g/L. fenoxaprop-p-ethyl + 210 g/L. MCPA Ester + 70 g/L. 2,4-D Ester, 2 x 8.1 L containers.
    2. Plus; Dry flowable; thifensulfuron; 75%, 2 x 81 g containers.
2. **Registered Mixes:** Lontrel.
3. **Crops:** Barley (all spring varieties).
4. **Weeds Controlled:**

annual sunflower
ball mustard
burdock
chickweed
cocklebur
corn spurry
cow cockle
field horsetail
flixweed
green foxtail
green smartweed
hemp-nettle
hoary cress
kochia
lady's-thumb
lamb's-quarters
mustards (except dog, green tansy)
plantain
prickly lettuce
ragweeds
redroot pigweed
Russian pigweed
Russian thistle
shepherd's-purse
stinkweed
vetch
volunteer rapeseed (including CLEARFIELD)
wild buckwheat
wild mustard
wild oats
wild radish
yellow foxtail

Champion Plus (cont'd)

5. **Weeds Suppressed:** Canada thistle.
6. **When Used:**

Crop stage: Treatment at the 3 to 4 leaf stage of both crop and grassy weeds combines maximum crop tolerance and weed susceptibility. However, Champion Plus may be applied to barley that has a minimum of 2 leaves and up to a maximum of 5 leaves on the main stem. Plants must not have more than 2 tillers. The 2-tiller stage of barley usually occurs within 25 days of seeding.

Weed stage:

Annual grassy weeds: Green foxtail, yellow foxtail, wild oats: 1 leaf up to a maximum of 5 leaves on the main stem plus 2 tillers.

Broadleaf weeds:

2 - 4 leaf stage: Annual sunflower, ball mustard, burdock, cocklebur, field horsetail, flixweed, hoary cress, kochia, mustards, plantain, prickly lettuce, ragweeds, Russian pigweed, shepherd's-purse, vetch and wild radish.

Less than 10 cm tall or across: Canada thistle, corn spurry, cow cockle, green smartweed, hemp-nettle, lady's-thumb, lamb's-quarters, redroot pigweed, Russian thistle, stinkweed, volunteer rapeseed and wild mustard. Weeds that emerge after application will not be controlled.

Chickweed: 1 - 6 leaf stage.

Wild buckwheat: 1 - 3 leaf stage.

Note: Some broadleaf weeds may not be controlled under the following conditions: if infestation is heavy, weeds are in bud stage or weather is dry and cool. Under stressed conditions and/or heavy crop canopy, earlier application will result in improved grassy weed control.

7. **How to Apply:**

With: Ground equipment. Do not apply by air.

Rate: Champion FM: 0.81 L/ac. Plus: 8.1 g/ac.

Water volume: 45 L./ac.

Pressure: Ground 275 kPa.

Nozzles: Only 110° or 80° stainless steel flat fan nozzles are recommended. Uniform, thorough coverage is important to achieve good control.

Mixing instructions:

1. Ensure that the spray tank is thoroughly clean.
2. Fill the tank with half the required amount of water and start agitation or bypass system.
3. Slowly add the correct amount of Plus (container #1) to the spray tank. Agitate thoroughly until Plus is completely in suspension.
4. Add the correct amount of Champion FM (container #2) and continue agitation.
5. Triple rinse containers into the spray tank.
6. Add the remaining amount of water while agitation continues. Spray out immediately. Spray mixture should not be left in the tank overnight.
7. On repeat loads, prepare a Plus (container 1) slurry in water by slowly adding the correct amount of Plus to 20 L of water and add to the spray tank. Agitate thoroughly until Plus is completely is suspension. Repeat steps 4, 5, and 6.

Sprayer cleanup:

When moving into wheat, barley, spring or fall rye immediately following the application of Champion Plus tank mix, clean the sprayer by thoroughly flushing with a water/detergent mixture.

Note: Broadleaf crops can be damaged by Champion Plus tank mix residues in the spray tank even after a number of applications of a different product. It is critical to thoroughly clean and remove all traces of Champion Plus tank mix from the spray tank prior to moving into a broadleaf crop.

When moving into broadleaf crops: In all cases, prior to spraying a broadleaf crop (such as canola, peas, lentils, alfalfa, sugar beets, vegetables, etc.), complete a thorough cleaning of the tank, because the Plus component of Champion Plus tank mix can cause crop injury to sensitive crops at very low concentrations. Follow the cleanup instructions below to ensure adequate sprayer cleaning and removal of the Champion Plus tank mix.

Cleanup instructions prior to spraying broadleaf crops:

1. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
2. Drain tank and flush tank, boom and hoses with clean water for a minimum of ten minutes. Visually inspect tank to assure removal of all residues. If necessary, repeat step.
3. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 L of water. Flush solution through boom and hoses, and then add more water to completely fill tank. Allow to sit for 15 minutes with agitation. Again, flush the hoses, boom and nozzles with cleaning solution and drain tank.
4. Repeat step 3.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips:** During periods of stress, plants are not actively growing. When daytime temperatures before or after application are very hot (28°C or 82°F) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Champion Plus tank mix during these periods may result in substantially reduced control. Application of the spray at a forward angle of 45° will result in better penetration of the canopy and better coverage. Do not apply to crop that is stressed by severe weather conditions, frost, low fertility, drought, water saturated soils, disease or insect damage as crop injury may result. A time interval of 7 days prior to application of Champion Plus is required before another pesticide can be applied.

9. **How it Works:** Fenoxprop-p-ethyl: Contact as well as systemic, no soil activity. Regions of high meristematic activity such as root and shoot tips are known to be affected.

MCPA, 2,4-D: Disrupts cell division and causes abnormal growth responses that affect respiration and food reserves.

Thifensulfuron: Absorbed by foliage. Inhibits cell elongation.

0. **Expected Results:** Grassy weeds: reduction of leaf growth and chlorotic blotching within 1 - 3 days after application. Initial development of leaf chlorosis within 5 - 8 days after application and complete death within 14 - 21 days after application. Broadleaf weeds – growth stops almost immediately. Discolouration of dying weeds may not be noticeable for 1 - 3 weeks after application depending on growing conditions and weed susceptibility. Poor results may be expected if improper mixing, timing, coverage or when weeds are under drought stress.

. **Effects of Rainfall:** Do not apply Champion Plus if rain is expected within 2 hours.

. **Movement in Soil:** Fenoxaprop-p-ethyl appears to undergo rapid hydrolysis in the soil. Thifensulfuron moves very little in the soil and has a very short life in the soil.

. **Cropping Restrictions:**

Grazing restrictions: Do not graze treated fields prior to harvest.

Other restrictions: Preharvest interval 50 days.

. **Toxicity:**

Fenoxaprop-p-ethyl + MCPA Ester: Acute oral LD_{50} (rats) = 2,940 mg/kg.

Thifensulfuron: Low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.

2,4-D: Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 300 - 1,200 mg/kg. Some formulations may cause skin irritation. Some formulations are toxic to fish. May cause burns and can be absorbed through the skin.

Champion Plus (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Keep away from fire or open flame or other sources of heat. Cannot be stored below freezing. If stored for 1 year or longer, shake well before using.
17. **Resistance Management:** Champion Plus is considered to be part of Group 1, Group 2 and Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Champion Plus and other Group 1, 2 and 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Crossfire *(tribenuron methyl + metribuzin)*

Group 2,5

Manufacturer: DuPont Canada Inc.

CAUTION POISON

1. **Formulations:** TBM75 Herbicide, tribenuron methyl 75%; 4 x 40.5 g water soluble pouches: Fire DF Herbicide, metribuzin dry flowable 75%; 4 x 540 g water soluble pouches. Bag-in-a-bag; 4 water soluble pouches, each containing 540 g metribuzin dry flowable 75% and also containing 1 water soluble pouch filled with 40.5 g tribenuron methyl dry flowable 75%.
2. **Registered Mixes: Crossfire Herbicide tank mix must be used only as a tank mix with MCPA Amine. Do not use Crossfire alone.** Directions for the proper use of Crossfire Herbicide tank mix appear on the label attached to the TBM75 Herbicide Portion of the tank mix.

    Mixing instructions: Add one-half of the necessary volume of water to the spray tank. With the agitator running, add the required number of Fire DF Herbicide Toss-N-Go pouches. When the Fire DF Herbicide is in suspension, add the required number of TBM75 Herbicide Toss-N-Go pouches. Add the remaining water. Add the appropriate amount of MCPA Amine last. Continuous agitation is required.
3. **Crops:** Spring barley, spring wheat (excluding durum).
4. **Weeds Controlled:** (Crossfire and tank mixes) –

    Canada thistle (top growth control)
    common chickweed
    (including sulfonylurea-tolerant populations)
    hemp-nettle
    lamb's-quarters
    stinkweed
    volunteer canola
    (including CLEARFIELD)
    wild mustard
5. **Weeds Suppressed:** (Crossfire and tank mixes) – Annual sow-thistle, wild buckwheat.
6. **When Used:**

    Crop stage: Barley, spring wheat (excluding durum wheat): Full 3 leaf stage to full 5 leaf stage. For best crop safety, apply at mid-tillering or sooner. Do not use on the Klondike variety of barley, or barley varieties with Klondike parentage, such as AC Lacombe.

    Weed stage: For best results, apply to young, actively growing weeds that are less than 10 cm tall or across and before the crop canopy closes. Weeds that emerge after treatment will not be controlled.

7. **How to Apply:**

   With: Ground equipment only. Do not apply by air.

   Rate: 4 g/ac TBM75 Herbicide + 53 g/ac Fire DF Herbicide + 0.22 L/ac MCPA Amine 500.

   Surfactant: None.

   Water volume: 40 L/ac minimum.

   Pressure: Do not exceed 275 kPa spray pressure.

   Nozzles: Flat fan nozzles, 80° or 110°. Use 50 mesh filter screens or larger (metal or nylon).

   Sprayer cleanup:

   1. Drain tank, then flush tank, boom and hoses with clean water for a minimum of ten minutes to remove all visible residues.
   2. Fill the tank with clean water, then add 1 liter of household ammonia (containing a minimum of 3% ammonia) per 100 liters of water. Fill the boom and hoses with solution and allow the sprayer to sit for 15 minutes. Drain.
   3. Repeat step 2.
   4. Nozzles and screens should be removed and cleaned separately. To remove traces of ammonia, rinse the tank, hoses and booms thoroughly with clean water.
   5. Dispose of tank rinseate according to Provincial directions.

   Caution: Do not use ammonia with chlorine bleach. Using ammonia with chlorine bleach will release a gas with a musty chlorine odour which can cause eye, nose, throat and lung irritation. Do not clean equipment in an enclosed area.

8. **Application Tips:** When applying sequentially with a wild oat herbicide, if not specified on the wild oat herbicide label, allow 4 - 5 day interval after the application of the wild oat product or 7 days before the wild oat product. Control depends on growing conditions and weed susceptibility. Degree of control and duration of effect depend on weed sensitivity, weed size, spray coverage and growing conditions. Warm, moist growing conditions promote active weed growth and enhance the activity of the Crossfire Herbicide tank mixture by allowing maximum foliar uptake and contact activity. If the spray preparation is left standing without agitation, thoroughly agitate the mixture to resuspend the mixture before spraying. Do not allow the mixture to stand for more than an hour without agitation. Uneven application such as swath overlapping, variable tractor speed, spraying on turns, etc. may result in crop injury and increase injury to rotating crops.

9. **How it Works:** Absorbed by foliage, inhibits photosynthesis as well as cell elongation.

10. **Expected Results:** Crossfire Herbicide tank mixture rapidly stops growth of common chickweed, including sulfonylurea tolerant populations. However, typical symptoms (discolouration) of dying weeds may not be noticeable for 1 - 3 weeks after application. Herbicide activity may be delayed by cold, dry conditions after application.

11. **Effects of Rainfall:** If rain occurs soon after application, control may be reduced. If heavy rains occur soon after application, plant injury may result, especially in poorly drained areas where water may stand for several days. At least 4 - 6 hours of dry weather is needed to allow Crossfire Herbicide tank mixture to be absorbed by weed foliage. Environmental conditions that slow the drying of the spray mixture on the foliage such as high relative humidity, cool air temperatures or cloud cover may increase the time required.

12. **Movement in Soil:** Do not use on muck soil or subsequent crops may be injured.

13. **Cropping Restrictions:** Rotation crops such as onions, celery, peppers, cole crops, lettuce, spinach, sugar beets, table beets, turnips, pumpkin, squash, cucumbers, melons, tobacco and canola may be injured if planted both during the year of application or the following crop year.

    Grazing restrictions: Do not graze or feed crop to livestock within 30 days of application.

    Other restrictions: Do not apply within 60 days of harvest.

14. **Toxicity:** Slightly toxic by inhalation (LC$_{50}$ (rats) 4 hours, is greater than 885 mg/m^3). Slightly toxic by ingestion (LD$_{50}$ (rats) is 2,795 mg/kg). Contact eye irritant (rabbits).

Crossfire (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If inhaled**, remove individual from site of exposure to fresh air. Consult a physician or Poison Control Centre. **If swallowed**, seek medical attention.

16. **Storage:** Store in a cool, dry place. Keep away from fire, heat or open flame.

17. **Resistance Management:** Crossfire is both a Group 2 and a Group 5 herbicide. Any weed population may contain or develop plants naturally resistant to Crossfire and other Group 2 and 5 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Curtail M *(clopyralid + MCPA Ester)*

Group 4

Manufacturer: Dow AgroSciences Canada Inc.

CAUTION POISON

1. **Formulations:** Emulsifiable concentrate; 50 g a.e./L; clopyralid, + 280 g a.e./L MCPA Ester 2 x 8 L jug.

2. **Registered Mixes:**

    Barley, spring wheat, durum wheat: Achieve Liquid (200 mL/ac) + Turbocharge adjuvant.

    Barley, spring wheat (excluding durum): Avenge 200C, Refine Extra.

    Durum wheat, spring wheat: Everest 70DF Solupak, Horizon (95 mL/ac) + Score adjuvant, Puma^{120} Super (312 mL/ac for barnyard grass, green foxtail and wild oats).

    Spring wheat (excluding durum): Assert 300SC + acidulate.

3. **Crops:** Barley, CPS, durum wheat, hard red spring wheat, oats, soft white spring wheat, utility wheat, timothy (seedling, established).

    Underseeding: Do not apply to crops underseeded to legumes or companion crops.

4. **Weeds Controlled:**

800 mL/ac

annual sow-thistle (8.7)
Canada thistle (8.1)*
common groundsel (9.0)
dandelion (7.4)**
flixweed**
lamb's-quarters (9.0)
perennial sow-thistle (top growth) (8.6)
redroot pigweed (7.7)
Russian pigweed
scentless chamomile (2 - 4 leaf)
shepherd's-purse**
smartweed (7.9)
stinkweed (9.0)**
tartary buckwheat
volunteer canola (9.0)
wild buckwheat (8.2)
wild mustard (9.0)

600 mL/ac

Canada thistle (light infestations) (8.1)*
flixweed (spring seedlings 2 - 4 leaf)
lamb's-quarters
shepherd's-purse (spring seedlings 2 - 4 leaf)
stinkweed (spring seedlings 2 - 4 leaf) (9.0)
volunteer sunflower
wild mustard

* Season-long control, with some regrowth in the fall.
** Spring rosettes only.

5. **Weeds Suppressed:** Kochia (2 - 4 leaf).
6. **When Used:**

   Crop stage: Barley, Canada prairie soft wheat, durum wheat, hard red spring wheat, oats, soft white spring wheat and utility wheat: 3 leaf just before flag leaf.

   Weed stage: Broadleaf weeds: 1 - 4 leaf stage of growth. **Canada thistle:** 10 - 15 cm in height.
7. **How to Apply:**

   With: Ground equipment only. Do not apply by air.

   Rate: 800 mL/ac. Under low Canada thistle population and easier to control weeds – 600 mL/ac.

   Water volume: 40 - 60 L/ac.

   Pressure: 275 kPa.

   Nozzles: Flat Fan type. Use 50 mesh or larger screens.

   Mixing instructions: Clean spray tank and add 1/2 required amount of water. With agitator running, add the required amount of Curtail M. Add the remaining amount of the water and continue to agitate while spraying.
8. **Application Tips:** When weeds are under extreme drought stress or showing effects of excessive moisture, control can be reduced or delayed. Weed escapes may occur under prolonged stress conditions or low fertility. Do not apply to weeds stressed for more than 20 days due to lack of moisture as unsatisfactory control can result. Ensure uniform spray coverage over the entire area of target weeds.
9. **How it Works:** Clopyralid is a growth regulator type of herbicide. It is primarily absorbed through the foliage and is translocated to all parts of the plant causing leaf and stem twisting and yellowing and then death. MCPA is a systemic herbicide for broadleaf weeds which is translocated throughout the plant causing rapid undifferentiated growth, which usually results in the death of susceptible weeds.
10. **Expected Results:**

    Broadleaf weeds: Weeds start to twist after spraying, and after twisting and bending, plants turn brown and die.

    Difficult to control weeds such as Canada thistle and wild buckwheat stop growing, change colour to dark green and then turn yellow before they die. Death may not occur for 14 - 21 days after application. Some weak Canada thistle regrowth may occur by end of season.
11. **Effects of Rainfall:** Do not apply if rain is expected in 6 hours.
12. **Movement in Soil:** MCPA is readily leached from soil. Clopyralid is somewhat soluble in water, but it is generally not mobile in soil under typical prairie conditions.
13. **Cropping Restrictions:**

    Succeeding crops: Fields treated with Curtail M herbicide tank mix can be seeded the following year to barley, canola, corn, flax, forage grasses, mustard, oats, peas, rye, sugar beets, wheat or summerfallowed. Do not seed crops other than those listed above for at least one year after treatment.

    Grazing restrictions: Do not cut or graze treated fields of barley, oats or wheat within 7 days of application.
14. **Toxicity:**

    Clopyralid: Very low acute mammalian toxicity. Acute oral LC_{50} (rats) = >2,000 mg/kg. Acute oral LD_{50} (bees) = >100 μg/bee. Extremely toxic to fish.

    MCPA: Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 700 - 880 mg/kg. Low toxicity to fish. May cause burns upon contact with skin and eyes, and it can be absorbed through the skin.

Curtail M (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If inhaled**, remove individual from site of exposure to fresh air. Consult a physician or Poison Control Centre. **If swallowed**, seek medical attention.
16. **Storage:** Dry heated storage preferred.
17. **Resistance Management:** Curtail M is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Curtail M and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Diphenoprop BK700

(2,4-D + dichlorprop)

Group 4

Manufacturer: **United Agri Products**

WARNING POISON

1. **Formulations:** Emulsifiable concentrate; 329 g/L 2,4-D + 350 g/L dichlorprop; 10 L, 115 L, 205 L containers.
2. **Registered Mixes:** Vanquish.

    Mixing instructions: Add 1/2 amount of carrier, start agitation, add herbicide, add rest of carrier. If used in oil, do not let water get in mixture.
3. **Crops:** Non-crop areas, industrial areas, rights-of-way and roadsides.

    Underseeding: Not applicable.
4. **Weeds Controlled:**

Brush

alder
aspen
balsam fit
basswood
birch
blueberry
buckbrush
bur oak
elderberry
elm
ground juniper
hardhack
hawthorn
hazel
hickory
honeysuckle
Manitoba maple
poison-ivy
poplar
red pine
Scotch pine
silver maple
sumac
tamarac
tame raspberry
white cedar
white oak
wild apple
wild cherry
wild plum
wild raspberry
willow

Weeds

alfalfa
broadleaf weeds
  (most annual)
bull thistle
burdock
buttercup
Canada thistle
chicory
cinquefoil
curled dock
dandelion
dogbane
goat's-beard
goldenrod
hawkweed
horsetail
mullein
perennial sow-thistle
plantain
sweet clover
tansy
teasel
vetch
wild carrot
yellow rocket

5. **Weeds Suppressed:** Milkweed, rose, sugar maple, toadflax.
6. **When Used:** Throughout growing season.

7. **How to Apply:**

   With: Aircraft, power equipment, knapsack sprayer.

   Rate: Brush: 7.0 - 11.0 L in 1,000 L of water for foliage stem treatment. Weeds: 2.3 - 6.7 L/ac.

   Water volume: Spray to point of runoff. For fixed wing application – 8 L/ac minimum. Water may be replaced by oil.

   Pressure: As recommended for equipment used.

   Nozzles: Flat fan recommended.

8. **Application Tips:** Forms an emulsion in water – agitate to prevent separation.
9. **How it Works:** A translocated, systemic herbicide absorbed by leaves.
10. **Expected Results:** Leaves brown and wilt shortly after spraying – no leaves appear the following year.
11. **Effects of Rainfall:** Rain within 3 or 4 hours after application may reduce control.
12. **Movement in Soil:** Leaching does not pose a problem.
13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

    Drift: Over susceptible crops, causes injury.

14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = 2,4-D 300 - 1,000 mg/kg; dichlorprop = 800 mg/kg. Do not apply when bees are foraging. Toxic to bees. May cause burns and may be absorbed through the skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** If frozen, warm to 5°C and mix well.

    Note: Similar products are Estaprop/Turboprop 600.

17. **Resistance Management:** Diphenoprop BK700 is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Diphenoprop BK700 and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42)*.

Dual II Magnum *(metolachlor)*

Group 15

Manufacturer: **Syngenta Crop Protection Canada Inc.**

1. **Formulations:** Emulsifiable concentrate; 915 EC; 1 x 12 L jugs.
2. **Registered Mixes:** May be applied as split application or tank mixed as follows. With Aatrex Liquid, Aatrex Nine-O. Liquid nitrogen – 28% nitrogen solutions or complete liquid fertilizers may replace all or part of the water for pre-plant incorporated or pre-emergent application of Dual tank mixes in corn.

Dual II Magnum (cont'd)

Mixing restrictions: Do not tank mix with Banvel, Estemine 2,4-D. Do not impregnate on nitrate fertilizers (ammonium, potassium, sodium, calcium) or on single superphosphate (0-26-0), triple superphosphate (0-46-0) or on ammonium phosphate or on limestone. Fertilizer blends containing limestone may be impregnated. For tank mixes for crops other than corn, refer to Dual label.

3. **Crops:**

black spruce (second year or older)
broccoli
cabbage (transplanted)
cauliflower
corn (all types)
dry common beans
fruit trees (second year or older)
Jack pine
kidney beans
lima beans
Norway spruce (second year or older)
pinto beans
poplar (second year or older)
potatoes (except Superior)
processing peas
snap beans
red pine
soybeans
sugar beets
sweet white lupins
tomatoes (transplanted)
white beans
white pine
white spruce (second year or older)

4. **Weeds Controlled:** Barnyard grass, green and yellow foxtail plus weeds controlled by the second material in mix or oversprayed, American nightshade, Eastern black nightshade, fall panicum, hairy crabgrass, old witchgrass, smooth crabgrass, yellow nutsedge.
5. **Weeds Suppressed:** Redroot pigweed (pre-plant incorporated and pre-emergent treatments only).
6. **When Used:** Pre-plant incorporated or irrigated within 10 days if applied pre-emergent.
7. **How to Apply:**

With: Ground equipment: band or overall spray.

Rate: Corn: 0.7 L/ac.

Corn: Tank mixes of Dual II Magnum at above rate plus:

Weeds controlled	Tank mixes for corn pre-plant	Split application pre-emergent (under irrigation only)
Annual grasses and broadleaf weeds	Aatrex Nine-0 – 0.5 - 0.7 kg/ac or Aatrex Liquid – 0.9 - 1.3 L/ac	Aatrex Nine-0 – 0.5 - 0.7 kg/ac or Aatrex Liquid – 0.9 - 1.3 L/ac

Water volume: 70 - 140 L/ac.

Incorporation: Incorporate to 5 cm. Do not exceed this depth since product dilution can occur. If using tandem discs, set to cut to a depth of 10 cm operated at 6 - 9 km/h. If using vibrating shank cultivators with overlapping sweeps, set 10 cm deep and operate at 10 - 13 km/h. Spike tooth or diamond tooth harrows are good incorporation equipment. Immediate incorporation is not necessary although desirable.

Pressure: 200 - 300 kPa.

Nozzles: Flat fan recommended.

8. **Application Tips:** For band treatments, use a press wheel ahead of the nozzle to level the band.
9. **How it Works:** Inhibits germination, particularly grasses.
10. **Expected Results:** Annual grasses do not germinate or under dry conditions, may die back soon after emergence.
11. **Effects of Rainfall:** Moisture required to move chemical to area of germination but an excess may move it below this area.
12. **Movement in Soil:** Some movement may occur if excess moisture on light soils.
13. **Cropping Restrictions:** Do not apply on muck, peat or high organic soils or after growth has begun. Winter cereals may be seeded 4.5 months after treatment.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 2,780 mg/kg, Dual (2,690). Prolonged exposure may cause eye injury. Slightly toxic to birds; non-toxic to fish.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Heated storage required.
17. **Resistance Management:** Dual II Magnum is a Group 15 herbicide. Any weed population may contain or develop plants naturally resistant to Dual II Magnum and other Group 15 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

DyVel *(dicamba + MCPA K-salt)*

Group 4

Manufacturer: BASF Canada

CAUTION POISON

1. **Formulations:** Water soluble solution; 84 g/L dicamba + 336 g/L MCPA K-salt; 2 x 10 L jugs.
2. **Registered Mixes:** Everest in spring wheat only (17.4 g/ac + Agral 90 or Ag-Surf at 0.25 L per 100 L of spray solution). Horizon in durum and spring wheat only. (wild oats: 95 mL/ac + Score at 0.8% v/v; green and yellow foxtail: 115 mL/ac + Score at 1.0% v/v). Puma^{120} Super (green foxtail: 156 mL/ac).

    Mixing instructions: When using DyVel + Horizon, add DyVel first, followed by Horizon, then Score.
3. **Crops:** Barley (8.1), durum wheat, oats (9.0), spring wheat (8.7), winter wheat.

    Underseeding: Legume underseeding not recommended.
4. **Weeds Controlled:**

annual smartweeds (7.7)
annual sow-thistle (6.6)
ball mustard (8.1)
burdock
cleavers (7.2)
cocklebur
common ragweeds
corn spurry (5.6)
cow cockle
false ragweeds
flixweed
giant ragweeds
hare's-ear mustard (8.8)
hemp-nettle (6.5)
Indian mustard (8.8)
kochia (7.9)
lady's-thumb (8.1)
lamb's-quarters (8.5)
perennial sow-thistle (7.6)
prostrate pigweed
redroot pigweed (7.8)
Russian pigweed
Russian thistle (7.0)
shepherd's-purse
stinkweed (8.4)
tartary buckwheat (7.6)
tumble mustard (8.8)
volunteer canola (8.1)*
volunteer sunflower
wild buckwheat (7.7)
wild mustard (8.6)
wild radish
wormseed mustard

* Apply before bolting when this weed is at the 2 - 4 leaf stage.

5. **Weeds Suppressed:** Canada thistle (7.3), cleavers and sow-thistle top growth control.
6. **When Used:**

    Crop stage: Barley, oats, spring wheat (including durum): 2 - 5 leaf stage.
    Winter wheat: Apply in spring when wheat is 15 - 25 cm tall or before shot blade stage.

    Weed stage: For cow-cockle and hemp-nettle, apply at the 2 - 3 leaf stage, and for corn spurry, apply at the 2 - 3 whorl stage.

DyVel (cont'd)

7. **How to Apply:**

   With: Aircraft or ground equipment.

   Rate: 500 mL/ac.

   Water volume: Air: 8 L/ac minimum. Ground: 45 L/ac.

   Pressure: Air: not above 200 kPa. Ground: 275 kPa.

   Nozzles: Flat fan recommended.

8. **Application Tips:** Best under good growing conditions and air temperature 10 - 25°C. Avoid application when crop is under stress from disease or adverse environmental conditions. Do not spray if rain is expected within 4 hours of application. Avoid application if frost or severe drop in night temperature is forecast. To prevent drift to sensitive crops, do not spray if temperatures are expected to exceed 30°C, when humidity is high or fog is present. Crop damage can occur if the chemical is applied at any time other than the recommended crop stage. Shortening of straw may occur without loss in yield.
9. **How it Works:** DyVel is a systemic herbicide absorbed through the roots and leaves and translocated readily.
10. **Expected Results:**

    Weeds: Twisting, bending of main stem and leaf petioles, cupping of leaves or increase in root size occur within 10 - 14 days. Poor results may be expected if it rains within 4 hours of application, or when older weeds are sprayed or if less than recommended water volume is used.
11. **Effects of Rainfall:** Rainfall 4 hours after application will not reduce effectiveness.
12. **Movement in Soil:** At recommended rates, very little movement occurs.
13. **Cropping Restrictions:**

    Suceeding crops: No restrictions.

    Grazing restrictions: Allow 30 days after application of DyVel, or DyVel + Horizon, and grazing or cutting of cereal crop for hay.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = dicamba 2,629 mg/kg, MCPA = 700 mg/kg. Non-toxic to birds, fish and bees. May cause burns and can be absorbed through the skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Protect from freezing, but if frozen, no activity is lost if completely resuspended.
17. **Resistance Management:** Dyvel is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Dyvel and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

DyVel DS *(2,4-D + mecoprop + dicamba)*

Group 4

Manufacturer: **BASF Canada**

CAUTION POISON

1. **Formulations:** Liquid; 295 g/L 2,4-D + 80 g/L mecoprop + 110 g/L dicamba; 2 x 10 L jugs.
2. **Registered Mixes:** Aatrex Liquid or Aatrex Nine-0 (corn). Everest in spring wheat only (17.4 g/ac + Agral 90 or Ag-Surf at 0.25 L per 100 L of spray solution). Puma Super (green foxtail: 200 mL/ac). Puma^{120} Super (green foxtail: 156 mL/ac).
3. **Crops:**

barley (8.5)
durum wheat (7.9)
field corn (8.3)
native rangeland
permanent pasture
roadsides
spring wheat (7.9)
summerfallow
stubble fields
sweet corn (8.3)
winter wheat (7.9)

Underseeding: Do not apply to crops underseeded to legumes.

4. **Weeds Controlled:**

In crops

annual smartweeds (7.7)
annual sow-thistle
ball mustard
Canada thistle (7.5)
cocklebur
common ragweed
corn spurry (7.3)
cow cockle (7.6)
field bindweed*
flixweed (7.8)
hedge bindweed*
Jerusalem artichoke (in corn)
kochia
knotweed
lady's-thumb
lamb's-quarters (8.5)
perennial sow-thistle (8.6)
prostrate pigweed
redroot pigweed (7.7)
Russian thistle (7.3)
shepherd's-purse (8.6)
stinkweed (8.6)
tartary buckwheat
volunteer buckwheat
volunteer canola
volunteer mustard
wild buckwheat (8.1)
wild mustard (8.6)
wormseed mustard

Pastures and along roadsides

alders
chicory
bull thistle
goat's-beard
poison-ivy
ragwort
sheep-laurel
white cockle

* If applied to field bindweed when it is actively flowering.

5. **Weeds Suppressed:** Canada thistle (7.5), cleavers (7.0), field bindweed, round-leaved mallow.
6. **When Used:**

Crop stage: Barley: 2 - 3 true leaf stage.*

Corn: Overall, spray prior to 15 cm height of corn; use drop nozzles after 30 cm height.

Wheat (durum, spring): 3 - 5 true leaf stage.*

Wheat (winter): In spring, before crop is 30 cm high.

Weed stage: For best results, apply when weeds are actively growing and are in the 2 - 3 leaf stage.

Summerfallow: When Canada thistle is in the early bud stage. Do not cultivate for a minimum of 4 weeks after treatment.

Pastures and roadsides: Spring, when weeds are in 2 - 5 leaf stage and actively growing.

* All leaf stages refer to true leaf stage, and tillers should not be counted as true leaves.

7. **How to Apply:**

With: Ground equipment.

Rate:

Barley: 340 mL/ac.

Wheat: 340 - 445 mL/ac.

Corn (field, sweet): 340 - 445 mL/ac.

Pastures and roadsides: 1.3 L/ac.

DyVel DS (cont'd)

Crop free land (stubble, summerfallow): 445 - 710 mL/ac.

Tank mix: 345 - 445 mL/ac + (Aatrex Liquid: 910 mL/ac or Aatrex Nine-0: 506 g/ac).

Water volume: 40 L/ac for cereals; 80 - 140 L/ac for corn.

Pressure: 275 kPa.

Nozzles: Flat fan recommended.

8. **Application Tips:** Ensure that proper rate, water volume and timing are used; otherwise, crop injury may occur. Risk of crop injury increases as water volume drops below 36 L/ac. Do not apply when temperatures exceed 27°C and relative humidity is very high. Use the 445 mL/ac rate for hard to kill weeds, suppression of cleavers and round-leaved mallow, for top-growth control of Canada thistle, when weeds are at an advanced growth stage, when weed densities are high, or under adverse weather conditions. Use the 345 mL/ac rate for easy to kill weeds, when weed densities are low and growing conditions are optimum. Apply to weeds that are actively growing and are in the 2 - 3 leaf stage for best results.
9. **How it Works:** Accummulates in the growing points resulting in abnormal growth which disrupts the transport system in plants.
10. **Expected Results:**

    Weeds: Visible effects occur 7 - 14 days after spraying. Leaves curl, leaf petioles twist, leaf edges turn brown, the whole plant ceases growth, eventually turns brown and dies.

    Crop: Improper applications can result in abnormal bending at the internodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels and sterile florets. Poor results may be expected with overmature weeds, inadequate coverage or rainfall less than 4 hours after application.
11. **Effects of Rainfall:** Do not spray if rain is expected within 4 hours.
12. **Movement in Soil:**

    2,4-D/mecoprop: Readily mobile in the soil.

    Dicamba: Relatively mobile; mobility affected by capillary movement and/or surface evaporation. Concentration and location in the soil profile will be determined by total seasonal precipitation, its frequency and original herbicide dosage.
13. **Cropping Restrictions:**

    Succeeding crops: No restrictions.

    Grazing restrictions: Do not permit lactating dairy animals to graze fields within 7 days. Do not harvest forage or cut hay within 30 days after application. Withdraw meat animals from treated fields at least 3 days before slaughter.

    Drift: Tomatoes, sugar beets, sunflowers, beans, turnips, cauliflower, cabbage, ornamentals and fruit crops are very sensitive to drift.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) formulated product = 1,000 mg/kg. Non-toxic to fish and bees. Intake may cause convulsions.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Heated storage preferred. If frozen, shake thoroughly before use.
17. **Resistance Management:** Dyvel DS is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Dyvel DS and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

2,4-D *(Amine, LV Ester)*

Group 4

Manufacturer: **Numerous Manufacturers**

WARNING POISON

1. **Formulations:** Liquids: Amines, LV Ester; Dry soluble powder.

Amine 500: Amsol; 2,4-D Amine; Estemine 2,4-D; No-Weed 2,4-D. 470 g/L. 4 L, 2 x 10 L, 20 L containers.

Amine 600: 2,4-D Amine (560 g/L), 2 x 10 L containers.

LV Ester 500: SEE - 2,4-D; 450 g/L; 2 x 10 L pack.

LV Ester 600: 2,4-D LV Ester (600, 96); No-Weed 2,4-D; 564 g/L; 2 x 10 L pack, 115 L.

LV Ester 700: 2,4-D LV Ester 700; 660 g/L; 20 L pails 2 x 10 L pack, 115 L, 205 L.

Savage: 2,4-D Amine (80%); 2 x 4.54 kg.

2. **Registered Mixes:**

2,4-D Amine: Atrazine (non-crop areas); atrazine + dicamba + mecoprop (corn); bromoxynil (barley, wheat); dicamba [barley, corn, non-crop areas, pastures, rangeland, red fescue (for seed only), rye (spring), turf, wheat (spring, winter)]; dicamba + mecoprop (barley, wheat); mecoprop (turf); propanil [wheat (durum, spring)]; Sencor (barley, wheat); sodium TCA (barley, brush, flax).

2,4-D Ester: Bromoxynil (barley, wheat); dicamba (non-crop areas, pastures, rangeland); dicamba + dichlorprop (non-crop areas, rangeland); dichlorprop (barley, non-crop areas, turf, wheat); difenzoquat (barley, Avenge wheat varieties); propanil [wheat (durum, spring)]; sodium TCA (brush).

Note: Some formulations can be mixed with liquid fertilizer (28-0-0).

3. **Crops:**

asparagus
barley (9.0)
corn
established turf
fall fallow stubble
fall rye (8.9)
grass pasture
grasses
non-crop areas
rangeland
spring rye (8.9)
spring wheat (8.7)
winter wheat (8.6)

* Use only if crop is heavily infested with MCPA resistant weeds; crop injury may occur.

4. **Weeds Controlled:**

Note: First rating Amine; second rating Ester.

ball mustard (8.3) (8.2)
bluebur
burdock
cocklebur
common plantain
common ragweed
false ragweed
flixweed (4.6) (7.4)**
giant ragweed
hare'-ear mustard (8.3) (8.2)
Indian mustard (8.3) (8.2)
kochia (5.9) (7.3)
lamb's-quarters (8.0) (8.3)
prickly lettuce
Russian pigweed (7.0)
shepherd's-purse (8.6) (8.0)**
stinkweed** (7.2) (7.7)
sweet clover
thyme-leaved spurge
tumble mustard (8.3) (8.2)
vetch
wild mustard (8.3) (8.2)
wild radish
wild sunflower
wormseed mustard (8.3) (8.2)

** For the control of fall rosettes in stubble or fallow, apply to emerged weeds prior to freeze-up.

More resistant weeds

annual smartweeds (6.5) (5.5)
common peppergrass
common purslane
curled dock
dog mustard
field peppergrass
goat's-beard
hairy galinsoga
lady's-thumb
oak-leaved goosefoot
pineappleweed
prostrate pigweed
redroot pigweed (6.6)
Russian thistle (8.0) (7.5)
small-seeded false flax
tansy mustard
tumble pigweed

5. **Weeds Suppressed:** Top control or suppression.

alfalfa
annual sow-thistle (6.2)
biennial wormwood
blue lettuce
Canada thistle (4.6) (5.4)
creeping buttercup
dandelion (3.0)
field bindweed
field horsetail
gumweed
hedge bindweed
hoary cress
leafy spurge
narrow-leaved hawk's-beard
perennial sow-thistle
Russian knapweed
tartary buckwheat (5.2) (4.9)
wild buckwheat (4.8) (5.3)

6. **When Used:**

Crop stage: Asparagus: Just before first spears appear. May be repeated at the end of the cutting season.

Barley, spring wheat, rye: 3 leaf expanded to just before flag leaf.

Fall rye, winter wheat : Early spring, before flag leaf.

Corn: Up to 15 cm tall; at 15 - 20 cm tall, use drop nozzles to keep spray off corn.

7. **How to Apply:**

With: Aircraft or ground equipment.

Rate: Recommendations vary from label to label.

	Formulation and Concentration (quantity/ac)					
Crop	**Amine 500**	**Amine 600**	**Ester 500**	**Ester 600**	**Ester 700**	**Savage**
Asparagus	140 mL	NRF	NRF	NRF	NRF	650 g
Barley, rye, wheat	285 - 445 mL	243 - 405 mL	170 - 470 mL	210 - 385 mL	190 - 345 mL	166 - 261 g
Corn	200 - 445 mL	243 - 324 mL	NRF	285 mL	NRF	131 - 261 g
Resistant weeds in cereals	505 - 710 mL**	405 - 567 mL	465 - 750 mL**	375 - 610 mL**	375 - 445 mL**	–
Fallow	0.31 - 1.3 L	NRF	0.5 - 1.3 L	NRF	NRF	–
Fall fallow stubble	340 - 445 mL	NRF	340 - 445 mL	NRF	NRF	429 - 769 g
Non-crop areas	0.7 - 2.3 L	0.69 - 1.34 L	1.2 - 1.9 L	1.5 L	1.3 - 2.5 L	429 - 769 g
Pasture, rangeland, turf	0.81 - 1.7 L	0.69 - 1.34 L	0.75 - 2.1 L	0.61 - 1.1 L	0.61 - 1.0 L	405 g - 1.13 kg

* NRF – No Recommendation Found.
** Higher rates can be used if weed infestation is high, but some crop injury may occur.
*** Rates over 607 mL/ac may cause a delay in maturity.

Water volume: Aircraft: 12 L/ac minimum. Ground: Barley, corn, oats, rye, wheat: 40 - 80 L/ac; Flax: 45 - 70 L/ac recommended; Pasture, rangeland, turf: 182 L/ac.

Pressure: Air: 235 kPa or less; Ground: 200 - 275 kPa.

Nozzles: Flat fan recommended.

8. **Application Tips:** Recommendations vary from label to label; read label of product used. Do not use on sanfoin, bentgrasses, or freshly seeded grass. Spray during warm weather when the weeds are young and growing actively. At high temperatures, vapourization of more volatile Esters may cause injury to susceptible plants.

9. **How it Works:** Systemic, non-selective herbicide which is readily moves through foliage and root system. It inhibits pigment including chlorophyll leadng to lant death.

10. **Expected Results:** Susceptible plants become malformed before they die.

11. **Effects of Rainfall:** A rain-free period of 2 hours for Esters, 4 hours for Amine and 6 hours for salts is needed after application.

12. **Movement in Soil:** Leaching does not pose a problem.

13. **Cropping Restrictions:**

    Grazing restrictions: Do not permit lactating dairy animals to graze fields within 7 days after application. Do not harvest for livestock feed until 30 days after treatment. Withdraw meat animals from treated fields at least 3 days before slaughter. Tank mixes: Check label of other product for grazing restrictions.

14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 300 - 1,200 mg/kg. Some formulations may cause skin irritation. Some formulations are toxic to fish. May cause burns and can be absorbed through the skin.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Do not freeze Amine; if frozen warm to 4°C and mix thoroughly before using.

17. **Resistance Management:** 2,4-D is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to 2,4-D and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

2,4-D *(LV Ester)*

Industrial

Group 4

Manufacturer: Numerous Manufacturers

WARNING POISON

1. **Formulations:** Emulsifiable concentrate; low volatile ester; 570 g/L. Estasol LV600: 8 L jug; Esteron 600: 20, 205 L drum; No Weed 2,4-D: 10 L jug; 2,4-D Ester LV 600: 20 L pail, 2 x 10 L, 115 L; IPCO LV 700: 2 x 10 L, 110 L, 205 L.

2. **Registered Mixes:** Bromacil, dicamba, dicamba + dichlorprop, dichlorprop, picloram, sodium TCA.

    Mixing restrictions: Carriers: water, oil. Use only diesel oil No. 1 or No. 2 fuel oil or kerosene where oil is recommended. When using oil carriers, do not allow water to get into product or spray tank. (Oil mixes are very expensive; use may be limited to small areas during the dormant season.) Add 1/3 of the carrier, start agitation, add herbicide, then remainder of the carrier.

3. **Crops:** Forestry and industrial locations. To control unwanted vegetation.

4. **Weeds Controlled:**

    Brush: Alder, balsam poplar, birch, cherry, elm, hazelnut, Manitoba maple, sumac, trembling aspen poplar, western snowberry, willow.

    Weeds: Common broadleaf weeds.

5. **Weeds Suppressed:** Canada thistle, field bindweed.

6. **When Used:**

    Foliar treatment: After foliage is fully developed.

    Stump treatment: On freshly cut stump, anytime, including winter.

    Basal bark treatment: Anytime. Do not cut for 1 year after application.

7. **How to Apply:**

   With: Aircraft or ground equipment.

   Rate: Aircraft:

   Brush control: 6.6 L in 30 L of spray solution.

   Snowberry, willows: 1.33 L/ac.

   Ground: Foliar treatment: 8 L in 1,000 L of water; 6.25 L of LV 700 in 1,000 L of water.

   Stump treatment: 30 L in 1,000 L of diesel oil, fuel oil or kerosene; 25 L of LV 700 in 1,000 L of diesel fuel.

   Basal bark treatment: 20 - 30 L in 1,000 L of diesel oil, fuel oil or kerosene; 25 L of LV 700 in 1,000 L of diesel fuel.

   Frill treatment: 30 L in 1,000 L oil.

   Broadleaf weeds: 405 mL/ac - 1.6 L/ac.

   Pressure: Aircraft: 235 kPa or less. Ground: up to 1,700 kPa.
8. **Application Tips:** Wet all foliage and stems to point of runoff. Spray during warm weather when weeds and brush are actively growing. Continuous agitation is required for the oil-water mixture. Do not apply by air in dead-calm conditions as the "cloud" of suspended droplets may drift when wind comes up.
9. **How it Works:** Absorbed through leaves and bark in trees. A hormone-type herbicide causing an abnormal growth.
10. **Expected Results:** Brown crisp leaves first appear, then death.
11. **Effects of Rainfall:** A rain-free period of 4 - 6 hours is needed after application.
12. **Movement in Soil:** Minimal soil movement. 30 day half-life.
13. **Cropping Restrictions:** Intended for non-crop areas only. Use only on established turf grasses except creeping grasses such as bentgrass.
14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = 300 - 1,000 mg/kg. Some formulations may cause skin irritation. Toxic to fish and should not be introduced into aquatic environments.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for Cleaning of Clothes and Equipment (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store away from fertilizers, seeds, insecticides, fungicides or other herbicides intended for use on 2,4-D sensitive crops. If frozen, bring to room temperature before using.

Eclipse *(clopyralid + glyphosate)*

Group 4,9

Manufacturer: **Dow AgroSciences Canada Inc.**

CAUTION POISON

CAUTION IRRITANT

1. **Formulations:**

   Eclipse A: Clopyralid 360 g/L + **Eclipse B:** Glyphosate 360 g/L (acid equivalent present as isopropylamine salt); 3 x 6.2 L jugs.
2. **Registered Mixes:** None.
3. **Crops:** Glyphosate tolerant canola varieties only.

4. **Weeds Controlled:**

Canada thistle (season-long)
chickweed
cleavers
corn spurry
cow cockle
green foxtail
hemp-nettle
kochia
lady's-thumb
lamb's-quarters
night-flowering catchfly
quackgrass (season-long)
redroot pigweed
Russian thistle
shepherd's-purse
smartweed
stinkweed
volunteer barley
volunteer canola (non- glyphosate tolerant)
volunteer wheat
wild buckwheat
wild mustard
wild oats
wild tomato

5. **Weeds Suppressed:** Dandelion, perennial sow-thistle.

6. **When Used:**

Crop stage: Glyphosate tolerant varieties only. Apply at the 2 - 6 leaf stage of the crop.

Note: Some short term visual yellowing may occur when a late application (4 - 6 leaf stage) of Eclipse herbicide is applied to the crop, on canola varieties.

7. **How to Apply:**

With: Ground equipment only. Do not apply by air. **Note:** Do not use galvanized steel or unlined steel tanks as a combustible gas may be formed.

Rate: Eclipse A: 113 mL/ac. Eclipse B: 506 mL/ac.

Water volume: 40 L/ac.

Pressure: Use low pressures 200 to 275 kPa.

Nozzles: Use nozzles that deliver higher volumes and coarser droplets.

8. **Application Tips:** Apply when the canola is in the 2 - 6 leaf stage. Ensure that the crop has not advanced beyond the recommended leaf stage for application. Treat crops during warm weather when weeds are actively growing. Best results are obtained when Canada thistle is actively growing and soil moisture is adequate for rapid growth. Do not treat weeds under poor growing conditions such as cool, dry conditions, drought stress, disease or insect damage as reduced weed control may result. Reduced results may occur when treating weeds heavily covered with dust. Reduced results may occur if water-containing soil is used, such as water from ponds and unlined ditches.

9. **How it Works:** Eclipse tank mix is readily absorbed by foliage and roots. It translocates both upwards and downwards in plants. Eclipse A is a systemic, hormone-type herbicide. It is absorbed by leaf, stem surfaces and roots. It is readily translocated upwards and downward. Eclipse B is a non-selective, systemic herbicide that moves from the foliage into the roots and kills the entire plant. Maximum efficacy results from foliar application to young, actively growing plants.

10. **Expected Results:** Under good growing conditions, wilting and yellowing of annuals occurs within 2 - 4 days. Herbicide symptoms on affected annual and perennial weeds may also include swollen growing points and roots, cupping of leaves, twisted and distorted stems and leaves. Cool or cloudy weather may slow activity. Affected weeds turn yellow before turning brown as they die. Death of weeds may not occur until 14 - 21 days after application. Browning of above ground growth and deterioration of roots occurs.

11. **Effects of Rainfall:** Heavy rainfall immediately after application may wash the chemical off the foliage, and a repeat treatment may be required. Do not apply if rainfall is forecast for the time of application.

12. **Movement in Soil:** Eclipse A herbicide is somewhat soluble in water but is generally not mobile in soil under typical prairie conditions. The amount of Eclipse B herbicide leaching is very low.

13. **Cropping Restrictions:**

Succeeding crops: Fields treated with Eclipse herbicide tank mix can be seeded the following year to barley, canola, flax, forage grasses, mustard, oats, peas, rye, wheat or summerfallowed.
Do not seed crops other than those listed above for at least one year after treatment.

Eclipse (cont'd)

Manure and straw: Residues of Eclipse tank mix occurring in the straw may be harmful to susceptible plants. Do not use straw or crop residue from treated crops for composting or mulching susceptible broadleaf crops. If straw or crop residue is used for animal bedding or feed, return the manure to fields to be planted to clopyralid tolerant crops. Do not grow susceptible broadleaf crops such as beans, lentil, potato and sunflower on land mulched with straw containing clopyralid residue within the last 12 months.

Drift management: Do not allow spray mist to drift since even small amounts of spray can cause severe damage to non-target crops and plants. Do not apply when winds are gusty or in excess of 8 km/h.

Grazing restrictions: Allow 3 to 5 days before grazing treated areas.

14. **Toxicity:**

Eclipse A: Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = >2,000 mg/kg. Acute oral LD_{50} (bees) = >100 µg/bee. Extremely low toxicity to fish.

Eclipse B: Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 4,320 mg/kg. Eye irritant. Non-toxic to bees, birds and fish.

15. **Precautions, First Aid:** Keep out of reach of children. Causes eye and skin irritation. Avoid contact with skin, eyes and clothing. After use, wash hands and other exposed skin. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. Avoid contamination of ponds, streams, rivers and desirable vegetation.

If in eyes or on skin, the affected areas should be thoroughly washed with cold water. **In case of eye contact**, wash with soap and water. Get medical attention immediately. **If inhaled**, remove individual to fresh air. Loosen tight clothing. Get immediate medical assistance. **If swallowed**, do not induce vomiting. Seek medical attention immediately.

16. **Storage:** Store away from food, feedstuff, fertilizer, seeds, insecticides, fungicides or other pesticides or herbicides intended to be used on crops sensitive to clopyralid. Store in heated storage. If products are frozen, bring to room temperature and agitate before use. Soak up small amounts of spill with absorbent clays.

17. **Resistance Management:** Eclipse is a Group 4 and a Group 9 herbicide. Any weed population may contain or develop plants naturally resistant to Eclipse and other Group 4 and 9 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Edge *(ethalfluralin)*

Group 3

Manufacturer: **Dow AgroSciences Canada Inc.**

1. **Formulations:** Granular; 5%; 25 kg bag and 544 kg returnable bag.
2. **Registered Mixes:** None.
3. **Crops:** Alfalfa (establishment), canola (9.0) (including triazine tolerant), caraway, coriander, dill, dry common beans, fababeans, kidney beans, peas (9.0), safflower (9.0), soybeans, sunflowers (8.7), white beans, yellow mustard (8.6). Lentils – fall application only.

4. Weeds Controlled:

- barnyard grass (8,2)
- blueweed
- chickweed (7.3)
- corn spurry
- cow cockle
- crab grass
- fall pancium
- giant foxtail
- green foxtail (8.5)
- kochia (7.0)
- lamb's-quarters (8.6)
- prostrate pigweed
- purslane
- redroot pigweed (8.2)
- volunteer wheat (7.9)
- wild buckwheat (8.3)
- wild oats (8.2)
- yellow foxtail

5. Weeds Suppressed: American nightshade, black nightshade, cleavers (6.4), hemp-nettle, lady's-thumb (7.7), Russian thistle, volunteer barley (6.3).

6. When Used:

Fall: Between September 1 and soil freeze-up.

Spring: Cultivate to destroy weeds; apply prior to seeding crop.

7. How to Apply:

With: Ground equipment only.

Rate:

Organic matter	Spring Sand to sandy loam 5% G.**	Spring Loams to clays 5% G.**	Fall Sand to sandy loam 5% G.**	Fall Loams to clays 5% G.**
2 - 4%	6.9 kg/ac	6.9 kg/ac	8.9 kg/ac	8.9 kg/ac
4 - 6%	6.9 kg/ac	8.9 kg/ac	8.9 kg/ac	11.3 kg/ac
6 - 15%	8.9 kg/ac	8.9 - 11.3 kg/ac*	11.3 kg/ac	11.3 kg/ac

* For improved results, use higher rates for fields with high populations of weeds.
** G. – Granular.

Incorporation: First incorporation must be done within 24 hours of application. Second incorporation should be done at right angles to the first.

Spring application: Apply Edge 5G when the soil is in good working condition. Ensure that the early season flush of weeds are killed by either first or second incorporation. Delay second incorporation a minimum of 3 days. This allows time for greater release of Edge from the granule into the soil and assures a more uniform distribution. Seed into a weed-free seedbed using accepted cultural practices.

Fall application: It is recommended that both incorporations be completed in the fall. For optimum weed control, prework the field early in the spring to promote germination of weeds and to allow green growth of resistant weeds to develop. Use a 5 - 8 cm deep cultivation with Vibrashank type cultivator or disc prior to seeding to destroy existing green growth. Seed into a weed-free seedbed using accepted cultural practices.

Implements: A tandem disc, discer, or field (vibrashank) cultivator is recommended. Set to work 8 - 10 cm deep. Discimplements at 7 - 10 km/hr; cultivators at 10 - 13 km/hr. Do not use a field cultivator to incorporate when soil is crusted, lumpy or too wet for good mixing. A tandem disc gives best mixing action on stubble.

8. Application Tips: To avoid concentrating wild oat and volunteer cereal seeds below the treated layer, do not plow the land prior to Edge application. Do not apply to fields spread with manure during the past 12 months. Do not apply to soils subject to prolonged periods of flooding or soils in poor working condition. If swath from previous crop has been removed by burning, cultivate once to remove the charcoal layer prior to Edge application. Edge 5G can be used where trash is heavier or on standing weeds provided they do not interfere with distribution of the granules and do not limit incorporation. Do not apply on soils with less than 2% organic matter. Application on eroded knolls or Grey Wooded Soils with highly variable texture and organic matter may result in a reduced crop stand, delayed development or reduced yield in either treated crop or rotational crop.

9. How it Works: A pre-emergence herbicide that kills seedlings as they germinate. Inhibits cell division in the actively growing points of the root and shoot. Does not control established weeds.

Edge (cont'd)

10. **Expected Results:**

    Weeds: Most die before emerging. Weeds will exhibit swelling of the coleoptile region, stubby, thick primary root development and lack of secondary roots. Plants die from lack of ability to obtain moisture.

11. **Effects of Rainfall:** No effect once incorporated into the soil.
12. **Movement in Soil:** None.
13. **Cropping Restrictions:**

    Succeeding crops: Will not harm rotational crops if used as directed. As a precaution, very sensitive crops such as oats, sugar beets or small-seeded grasses such as timothy, canary seed and creeping red fescue should not be grown following an Edge treated crop. Over application caused by overlapping, improper calibration or non-uniform application may reduce stands of crops grown in rotation. Drought conditions in the year of treatment may result in higher than normal levels of Edge in the soil at the end of the growing season. Therefore, to reduce the possibility of injury to rotational crops, seed shallow into a warm, moist seedbed using recommended agronomic practices which willl promote rapid germination and emergence of the rotational crop. Avoid direct seeding (zero till) and seeding into loose seedbeds. Refer to industry or government extension documents which outline seeding practices for each crop. Use good quality certified seed. As an additional safety precaution, seeding rate may be increased slightly (10%). As a precaution, do not seed wheat as a rotational crop on land that has received ethalfluralin or trifluralin at oilseed/special crop/barley rate for two consecutive years.

    Grazing Crops: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical >5,000 mg/kg. Direct contamination of any body of water may kill fish.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in areas not exposed to high temperatures or prolonged direct sunlight. Do not let Edge 5G remain in standing applicator under these conditions.
17. **Resistance Management:** Edge is a Group 3 herbicide. Any weed population may contain or develop plants naturally resistant to Edge and other Group 3 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Elite *(bromoxynil/MCPA + sethoxydim)*

Group 6,4,1

Manufacturer: **Nufarm Agriculture Inc.**

1. **Formulation:** Bromoxynil/MCPA 400 g/L; 11.36 L jug + sethoxydim 450 g/L; 3.65 L jug.
2. **Registered Mixes:** None.
3. **Crops:** Flax.

4. **Weeds Controlled:**

Broadleaf weeds controlled

American nightshade
ball mustard
bluebur
cocklebur
common buckwheat
common groundsel
common ragweed
cow cockle
flixweed
green smartweed
kochia
lady's-thumb
lamb's-quarters
night-flowering catchfly
pale smartweed
Russian thistle
scentless chamomile
(seedlings only)
shepherd's-purse
stinkweed
tartary buckwheat
volunteer rapeseed
volunteer sunflower
wild buckwheat
wild mustard
wild tomato
wormseed mustard

Grass weeds controlled

barnyard grass
crabgrass (large)
fall panicum
green foxtail
Persian darnel
proso millet
volunteer cereals
volunteer corn
wild oats
witchgrass
yellow foxtail

5. **Weeds Suppressed:** Canada thistle, perennial sow-thistle, quackgrass.

6. **When Used:**

Crop stage: Flax 5 - 10 cm.

Weed stage:

Broadleaf weeds controlled up to 4 leaf stage: American nightshade, ball mustard, bluebur, cocklebur, cow cockle*, flixweed, green smartweed, lady's-thumb, night-flowering catchfly, Russian thistle**, scentless chamomile***, shepherd's-purse, volunteer rapeseed, volunteer sunflower.

Broadleaf weeds controlled up to 8 leaf stage: Canada thistle (top growth), common buckwheat, common groundsel, common ragweed, lamb's-quarters, pale smartweed (seedlings), perennial sow-thistle (top growth), stinkweed, tartary buckwheat, wild buckwheat, wild mustard, wild tomato (up to 6 leaf stage), wormseed mustard.

* In normal conditions, cow cockle will be controlled up to the 4 leaf stage. Plants beyond this stage are unlikely to be controlled.
** Spray before plants are 5 cm high.
*** Spring annuals only.

Grass weeds controlled from 1 - 6 leaf stage: Barnyard grass, crabgrass (large), fall panicum, green foxtail, Persian darnel, Proso millet, volunteer corn, witchgrass, yellow foxtail, wild oats, volunteer cereals, suppression of quackgrass.

7. **How to Apply:** With ground equipment only.

Rate:

Mextrol: 567 mL/ac.

Poast Ultra: 190 mL/ac.

Merge: 0.4 L/ac.

One case treats 20 acres.

Water volume: 20 - 45 L/ac.

Pressure: 135 - 270 kPa.

Nozzles: Flat fan type. Use 50 mesh or larger screens.

8. **Application Tips:** This treatment may cause some leaf burn and check to crop growth and delayed crop maturity. Do not spray unthrifty crops or when flax is under stress due to drought or excess soil moisture. Do not spray in hot, humid weather conditions, when daytime temperatures are over 25 - 29°C.

9. **How it Works:** Bromoxynil is a contact type herbicide; therefore, good spray coverage is essential. Inhibits photosynthesis and plant respiration. MCPA is absorbed through leaves and is readily translocated in the plant. Sethoxydim is a contact and a systemic herbicide. Absorbed primarily by foliage and translocated to the growing points. Inhibits the formation of fatty acids in these tissues.

Elite (cont'd)

10. **Expected Results:** Weeds turn yellow and then brown.
11. **Effects of Rainfall:** Rainfall within 1 hour of application may reduce effectiveness.
12. **Movement in Soil:** Relatively immobile, breaks down rapidly in soil.
13. **Cropping Restrictions:**

    Succeeding crops: Allow a minimum of 14 days between application and re-planting of cereal or grass crop. A cultivation to a minimum depth of 10 cm is recommended 7 days prior to seeding. Otherwise, no restriction.

    Spray to harvest time: Flax – 60 days.

    Grazing restriction: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.
14. **Toxicity:** Bromoxynil/MCPA: High acute mammalian toxicity. Acute oral LD_{50} (rats) = 365 mg/kg. Very toxic to fish and birds. Non-toxic to bees. May cause burns and may be absorbed through the skin. Sethoxydim: Low acute mammalian toxicity. Acute oral LD_{50} (rats) = formulation 2,500 mg/kg. Causes moderate skin and eye irritation. Low toxicity to birds, fish and bees. Hazards to the environment are low because of rapid breakdown in soil.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store product in cool dry place.

Embutox 625/Caliber 400/ Cobutox 600 *(2,4-DB)*

Group 4

Manufacturer: Nufarm Canada/United Agri Products/Interprovincial Co-operatives Ltd.

WARNING POISON

1. **Formulations:** Emulsifiable concentrate; Caliber 400; 400 g/L, 10 L Cobutox 600; 600 g/L; 10 L container. Embutox 625; 625 g/L; 10 L jug. SEE 2,4-DB; 480 g/L, 10 L containers.
2. **Registered Mixes:** Avenge (refer to Avenge label for details), MCPA Amine, Embutox 625: MCPA Na-salt (300 g ai/L), MCPA K-salt (400 g ai/L).
3. **Crops:**

    alfalfa (seedling) (8.0)
    alsike clover (8.9)
    alsike white (8.9)
    barley (9.0)
    bird's-foot trefoil (seedling)
    grasses for forage (seedling)
    field corn
    oats (8.2)
    pastures (9.0)
    spring wheat (8.8)
4. **Weeds Controlled:**

    ball mustard (5.8)
    bull thistle
    chicory
    curled dock (8.0)
    lamb's-quarters (8.5)
    narrow-leaved hawk's-beard*
    oak-leaved goose-foot
    plantain
    ragweed
    redroot pigweed (7.5)
    shepherd's-purse (6.5)
    stinkweed
    wild buckwheat (5.7)
    wild mustard (5.8)**
    wormseed mustard (5.8)
    yellow rocket

    * Fall application for legumes.
    ** For better control tank mix with MCPA.

5. **Weeds Suppressed:**

Canada thistle (5.4)
dandelion
field bindweed
green smartweeds (5.4)
horsetail
lady's-thumb
perennial sow-thistle (5.4)

6. **When Used:**

Crop stage: Barley, oats and spring wheat: 5th leaf to early flag leaf.

Field corn: After crop is 38 cm high, but before the beginning of tasselling.

Legumes: Seedling alfalfa, bird's-foot trefoil: 1 - 4 trifoliate leaf. Seedling white, alsike clover: after the first trifoliate leaf.

Pastures: After cutting or grazing and before regrowth is 7.5 cm tall.

Weed stage: 1 - 3 leaf stage. **Narrow-leaved hawk's-beard:** Rosette stage in late fall after alfalfa has become dormant, but weeds are still growing.

7. **How to Apply:**

With: Ground equipment.

Rate:

Crop	Embutox 625 L/ac	Cobutox 600 L/ac	Caliber 400 L/ac
Alfalfa, bird's-foot trefoil, grasses (seedling; direct or underseeded)	0.7 - 0.9	0.7 - 0.9	1.1 - 1.4
Barley, oats, wheat	0.7 - 0.9	0.7 - 0.9	1.1 - 1.4
Clovers (seedling; direct or underseeded)	0.7 - 0.9	0.7 - 0.9	1.1 - 1.4
Dandelion, horsetail, smartweeds*	1.1	1.1	1.7
Field corn	0.7 - 0.9	0.7 - 0.9	1.1 - 1.7
Pasture (containing legumes)	0.7 - 1.1	0.7 - 1.1	1.1 - 1.7
Perennial weeds	0.9 - 1.1	0.9 - 1.1	1.1 - 1.7

* Seedlings only stunted.

Use 500 mL/ac Embutox 625 tank mixed with 47 mL/ac MCPA Na-salt or 36 mL/ac MCPA K-salt for improved wild mustard control beyond the 4 leaf stage. Refer to other formulation labels for tank mixes for wild mustard control.

Water volume: 60 - 80 L/ac.

Pressure: 275 kPa.

Nozzles: Flat fan recommended.

8. **Application Tips:** Damage to forage legumes (especially to established alfalfa) may occur and increase in severity the longer treatment is delayed beyond stage recommended. Do not spray in drought conditions. Oats are sensitive if treated before the 5 leaf stage. For better wild mustard control, tank mix with MCPA Amine for use on seedling alfalfa and bird's-foot trefoil – some crop stunting may occur. Use low rate when tank mixing with MCPA (see product label).

9. **How it Works:** Susceptible plants convert 2,4-DB to 2,4-D. Certain legumes do not convert it. 2,4-DB is translocated to actively growing parts.

10. **Expected Results:** Weeds should die within 2 - 3 weeks of treatment. Smartweeds seedlings only stunted.

11. **Effects of Rainfall:** Rainfall before the foliage has dried from the spraying may decrease activity.

12. **Movement in Soil:** Leaching does not pose a problem.

13. **Cropping Restrictions:**

Grazing restrictions: Do not graze or harvest for livestock feed until 30 days after treatment.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 1,960 mg/kg. Toxic to fish. Non-toxic to birds and bees.

Embutox 625/Caliber 400/Cobutox 600 (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Heated storage is not required. If frozen, warm to 20 - 22°C and agitate thoroughly.
17. **Resistance Management:** Embutox 625/Caliber 400/Cobutox 600 is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Embutox 625/Caliber 400/Cobutox 600 and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Eptam *(EPTC)*

Group 8

Manufacturer: **Syngenta Crop Protection Canada Inc.**

CAUTION POISON

1. **Formulations:** Emulsifiable concentrate; Eptam 8-E; 800 g/L; 10 L can.
2. **Registered Mixes:** Treflan and Rival [beans (dry common white and red kidney) only], Eptam 8-E + Lexone or Sencor (Irish potatoes), liquid or granular fertilizers (except nitrate based), Rival, Treflan.

    Mixing restrictions: Check fertilizer compatibility before tank mixing.
3. **Crops:** Alfalfa (7.7), bird's-foot trefoil, dry beans (7.8), flax (7.5), Irish potatoes (8.8), snap beans (8.7), sugar beets (8.3), sunflowers (7.8), turnips (rutabagas) (8.0).

    Seed production only: Cicer milk vetch, sweet clover. **Underseeding:** Not recommended.
4. **Weeds Controlled:**

    annual bluegrass (7.2)
    barnyard grass (8.6)*
    common chickweed
    corn spurry (9.0)
    green foxtail (7.7)*
    hairy nightshade (6.3)
    henbit
    Italian ryegrass (8.4)
    lamb's-quarters (6.4)*
    prostrate pigweed*
    purslane
    quackgrass
    redroot pigweed (6.3)*
    tumble pigweed*
    volunteer barley (7.0)
    volunteer oats
    volunteer wheat (7.9)
    wild oats (8.1)

    * In dry beans, improved control can be obtained by tank mixing with Treflan or Rival.
5. **Weeds Suppressed**: None.
6. **When Used:**

    Crop stage: Alfalfa, bird's-foot trefoil (seedings), cicer milk vetch, sweet clover – Pre-planting: Do not use if seeding a grain or grass nurse crop.

    Snap beans or dry beans (including red kidney) – Pre-planting: Do not use on cow peas or Adzuki, soy, lima or other flat-podded beans except Romano.

    Flax, sunflower – Spring – Pre-planting: Do not apply in spring to soils with less than 3% organic matter. Fall – Before freeze-up: Cultivate lightly to destroy any overwintering rosettes in spring before seeding.

    Potatoes: Incorporate in the fall or spring, after pre-emergence cultivation or before the last cultivation. Eptam 8-E can also be metered into sprinkler irrigation equipment (read label for instructions).

    Turnips: Apply and incorporate 6 - 10 days before planting.

    Sugar Beets: In sprinkler irrigation water.

    Note: Fall application should not be used in areas where soil drifting is a hazard.

7. How to Apply:

With: Ground equipment or irrigation water.

Rate:

Crop	Eptam 8-E L/ac	Crop	Eptam 8-E L/ac
Alfalfa, bird's-foot trefoil,	1.7	Potatoes (pre-plant, pre-emergent)	1.7 - 3.4
cicer milk vetch, sweet clover		(post-emergent)	1.7 - 2.2
Dry beans, snap beans	1.7 - 2.2	(sprinkler)	1.7 - 2.2
(see exceptions in *When Used*)		(fall)	2.2 - 3.4
Flax (spring; sandy soil)	1.4	Sugar beets (sprinklers)	1.1 - 1.7
(spring; clay soil)	1.7	Sunflowers (spring)	1.7
(fall; sandy soil)	1.7	(fall)	1.7 - 2.2
(fall; clay soil)	2.2	Turnips (sandy soil)	1.3
(Do not use on Flax south of Highway 1 in Alberta)		(clay soil)	1.7

Dry common beans, red kidney beans, white beans, Eptam 8-E + Treflan 545EC or Rival 500EC, 1.2 L/ac + 445 mL/ac or 486 mL/ac.

Water volume: 45 L/ac minimum.

Pressure: 275 kPa.

Nozzles: Flat fan recommended.

Incorporation: Incorporate immediately. Second incorporation must be at right angles to the first. Power-driven cultivation equipment, set to cut 5 - 7.5 cm deep. Tandem, one way discs, set to cut 10 - 15 cm and operate at 6.5 - 9.5 km/h followed by harrows. Field cultivators, for lighter soils in good tilth. Use 3 - 4 rows of sweeps spaced no wider than 18 cm. Cut 10 - 15 cm deep at 9.5 km/h. Pull a levelling device (such as harrows) behind incorporating equipment.

8. Application Tips: For use on mineral soils only. When applying Eptam 8-E with granular fertilizer, a minimum of 81 kg/ac and a maximum of 324 kg/ac of fertilizer is required. See product label for further instructions.

Flax, special instructions: Seed shallow, less than 3 cm, into a firm seedbed. Deep seeding reduces stands.

9. How it Works: Taken up by the roots and shoots of a germinating weed where it disrupts and stops further growth.

10. Expected Results:

Weeds: Absorbed by the weed shoot, therefore, most affected weeds will not emerge. Numerous chlorotic and bleached shoots may be visible by removing the top few inches of treated soil. Provides effective weed control for approximately 6 - 8 weeks.

Crops: If crop seedlings are weak, some injury may occur.

11. Effects of Rainfall: Very soluble in water so excessive moisture may cause leaching (usually not a problem in Alberta).

12. Movement in Soil: Eptam will move readily in the soil.

13. Cropping Restrictions:

Grazing restrictions: Do not graze or harvest for livestock feed in year of treatment.

Harvest restriction: Pre-harvest interval (days) after treatment – potatoes (45).

Succeeding crops: No restrictions.

14. Toxicity: Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 1,600 mg/kg. Very toxic to fish. Non-toxic to birds.

Eptam (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Heated storage not required. Store away from seed and fertilizer.
17. **Resistance Management:** Eptam is a Group 8 herbicide. Any weed population may contain or develop plants naturally resistant to Eptam and other Group 8 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Eradicane 8-E *(EPTC)*

Group 8

Manufacturer: Norac Concepts Inc.

CAUTION POISON

1. **Formulations:** Emulsifiable concentrate; 800 g/L; 10 L jug.
2. **Registered Mixes:** Atrazine (80W or F), liquid fertilizer, granular fertilizer, urea and urea blends. Sencor and Dual.

   Mixing restrictions: Check fertilizer compatability before tank mixing.
3. **Crops:** Field corn, sweet corn (9.0).
4. **Weeds Controlled:**

   annual bluegrass
   annual ryegrass
   barnyard grass (8.6)
   crabgrass
   common chickweed
   corn spurry
   green foxtail (7.7)
   hairy nightshade (6.3)
   henbit
   lamb's-quarters (6.4)
   prostrate pigweed
   purslane
   quackgrass
   redroot pigweed (6.3)
   tumble pigweed
   volunteer barley (7.0)
   volunteer oats
   volunteer wheat (7.9)
   wild oats (8.1)
   yellow foxtail
5. **Weeds Suppressed:** Wild proso millet.
6. **When Used:** Apply, incorporate and seed corn crop as soon as possible.
7. **How to Apply:**

   With: Ground equipment.

   Rate:

Crop	L/ac
Field corn, silage corn	1.7 - 3.4
Sweet corn	1.7 - 2.2
sandy soils	1.7
clay soils	2.2
annual weed control	2.2 (maximum)
quackgrass control	3.4

Water volume: 45 L/ac minimum

Pressure: 275 kPa.

Nozzles: Flat fan recommended.

Incorporation: Within minutes of application. Use power-driven cultivation equipment, set to cut 5 - 7.5 cm deep or discs set 10 - 15 cm – both these types of equipment should operate at 6.5 - 9.5 km/h. A second working at right angles to the first will provide adequate mixing. Pull a levelling device (such as harrows) behind incorporating equipment.

8. **Application Tips:** Proper soil coverage and immediate and adequate soil mixing are important.
9. **How it Works:** Absorbed by roots and shoots of a germinating weed, disrupts and stops growth and causes eventual death.
10. **Expected Results:**

    Weeds: Affected weeds do not emerge, chlorotic and bleached shoots are visible by removing a layer of treated soil.

    Crops: Weak seedlings may be injured. Poor results may be expected if soils are wet, cloddy and trashy or not suitable for proper application or incorporation.
11. **Effects of Rainfall:** Very soluble therefore, excessive moisture may cause leaching (usually not a problem in Alberta).
12. **Movement in Soil:** Will move readily.
13. **Cropping Restrictions:**

    Grazing restrictions: No restrictions on grazing, crop use after hail or on succeeding crops. Danger from drift is low.

    Caution: Excessive incorporation required may cause erosion on some soil.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 1,600 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Heated storage not required.
17. **Resistance Management:** Eradicane 8-E is a Group 8 herbicide. Any weed population may contain or develop plants naturally resistant to Eradicane 8-E and other Group 8 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Escort *(metsulfuron methyl)*

Group 2

Manufacturer: **DuPont Canada Inc.**

1. **Formulations:** Dry flowable; 60%; 250 g container.
2. **Registered Mixes:** 2,4-D Ester or Amine. **Surfactants:** Escort must be used with a recommended surfactant such as Ag-Surf, Agral 90, or Citowett Plus.

    Mixing instructions: Add 1/2 - 3/4 required amount of water. While agitating, add Escort and ensure it is completely suspended. If mixing with 2,4-D, add 2,4-D after the Escort is in suspension. Complete filling, then add surfactant. Continuous agitation is required. Antifoaming agent may be needed.

Escort (cont'd)

3. **Crops:** Non-crop areas, pasture, rangeland, rough turf.
4. **Weeds Controlled:** Common tansy, kochia, Russian thistle, scentless chamomile, sweet clover: 8 g/ac.

   Western snowberry plus above weeds: 10 g/ac.

   Dandelion, wild rose plus above weeds: 12 g/ac.
5. **Weeds Suppressed:** Canada thistle, sow-thistle.
6. **When Used:**

   Brush: Mid-June to mid-August after weed species has leafed out but before fall colouration begins.

   Weeds: Annuals – For best results, apply to young (less than 10 cm). Biennial and perennial weeds up to the early bud stage. Weeds should be actively growing at the time of application.
7. **How to Apply:**

   With: Ground equipment. Do not apply by air.

   Rate: 8 - 12 g/ac depending on weed species.

   Surfactant: 2 L/1,000 L spray solution.

   Water volume: 40 - 90 L/ac.

   Pressure: 275 kPa.

   Nozzles: Flat Fan types. 50 mesh or larger screens. Only metal or nylon filters.

   Sprayer cleanup: To avoid injury to susceptible crops, clean sprayer thoroughly immediately after spraying.

   1. Drain tank; then flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to assure removal of all visible residues of Escort. If necessary, repeat step 1.
   2. Fill the tank with clean water and add one litre of household ammonia (containing a minimum of 3% ammonia) per 100 litres of water. Fill boom and hoses with solution and allow sprayer to sit for 15 minutes. Drain.
   3. Remove the nozzles and screens, and clean separately in a bucket containing cleaning agent and water.
   4. Repeat step 2.
   5. Nozzles and screens should be removed and cleaned separately. To remove traces of ammonia, rinse the tank, hoses and booms thoroughly with clean water.
8. **Application Tips:** Apply as a full coverage spray to foliage and stems using equipment that will assure uniform coverage. Use spray preparation within 48 hours or product degradation may occur. If spray preparation is left standing without agitation, thoroughly agitate before spraying. Avoid overspray or drift to important wildlife habitats such as shelterbelts, wetlands, sloughs, and dry slough borders, woodlots, vegetated ditchbanks and other cover on the edge of fields. Leave a 50 metre buffer zone between the last spray swath and the edge of any of these habitats.
9. **How it Works:** Absorbed by foliage. Inhibits cell elongation.
10. **Expected Results:** Escort rapidly stops growth of susceptible species; however, typical symptoms (discolouration) may not be noticeable for several weeks after application, depending on growing conditions and weed susceptibility. Warm, moist conditions following treatment promote the activity of Escort while cold, dry conditions may reduce or delay activity. Brush hardened off by cold weather or drought stress may not be controlled.
11. **Effects of Rainfall:** Rainfall within 2 hours of application may lessen the degree of weed control.
12. **Movement in Soil:** Movement of Escort is restricted by fine-textured soils, soil organic matter and neutral to acidic conditions.
13. **Cropping Restrictions:**

    Grazing restrictions: The treated area may be grazed on the day of treatment.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place. Non-corrosive, non-flammable, non-volatile and does not freeze.
17. **Resistance Management:** Escort is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Escort and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Estaprop/Turboprop 600/ SEE Diphenoprop/ Dichlorprop-D/Interprop

(2,4-D + dichlorprop)

Group 4

Manufacturer: **Nufarm/United Agri Products/Interprovincial Co-operatives**

WARNING POISON

1. **Formulations:** Emulsifiable concentrate; 282 g/L 2,4-D Ester isomer specific + 300 g/L dichlorprop; Dichlorprop-D, 10 L; Estaprop; 10 L, 114 L container; Turboprop 600; 10 L, 115 L containers; SEE Diphenoprop; Solventless Concentrate; 222 g/L 2,4-D + 222 g/L dichlorprop; 10 L.
2. **Registered Mixes:** Assert 300SC, Avenge (barley, Avenge wheat varieties), Achieve 80DG, Everest, Horizon, Puma^{120} Super.

    Mixing instructions: Add 2,4-D + dichlorprop. Agitate. Add Avenge. Refer to Achieve 80DG write-up for mixing instructions. Puma: add Estaprop, then add Puma.
3. **Crops:** Barley (8.1), spring wheat (8.2), winter wheat (8.9). **Underseeding:** Legumes not recommended.
4. **Weeds Controlled:**

    annual sow-thistle (7.6)
    ball mustard
    bluebur (9.0)
    burdock
    cocklebur
    dog mustard
    flixweed (7.6)
    hare's-ear mustard
    Indian mustard
    kochia (8.1)
    lady's-thumb
    lamb's-quarters (8.4)
    night-flowering catchfly
    oak-leaved goosefoot
    ragweeds
    redroot pigweed (7.9)
    round-leaved mallow (6.9)
    Russian pigweed
    Russian thistle (8.1)
    shepherd's-purse (7.8)
    smartweeds (6.9)
    stinkweed (8.4)
    stork's-bill (7.3)
    tartary buckwheat (8.2)
    tumble mustard
    volunteer rapeseed
    volunteer sunflower
    wild buckwheat (6.8)
    wild mustard (8.6)
    wormseed mustard
5. **Weeds Suppressed:** Canada thistle (5.6), curled dock, perennial sow-thistle, round-leaved mallow**, toadflax. **(Turboprop, See Diphenoprop).

Estaprop/Turboprop 600/SEE Diphenoprop/Dichlorprop-D/Interprop (cont'd)

6. **When Used:**

   Crop stage: Barley, wheat (not underseeded with legumes: 4 leaf stage to the early flag leaf (shot blade) stage. Do not apply before the 4 leaf stage or between flag leaf to full-headed stages. Do not use on oats.

   Winter wheat: Should be treated in early spring only, between full tillering and early flag leaf stages.

   Weed stage: Apply when weeds are young and actively growing. Early spraying of stork's-bill, round-leaved mallow and kochia gives good control.

7. **How to Apply:**

   With: Ground or air equipment.

   Rate: 710 mL/ac.

   Water volume: 20 - 80 L/ac. Air: 12 L/ac.

   Pressure: 275 kPa. Air: 235 kPa.

   Nozzles: Flat fan recommended.

8. **Application Tips:** Crops under stress from adverse environmental conditions such as excess moisture, drought, or disease may suffer a further setback when Estaprop or Turboprop is applied; however, the crop injury that may occur is usually offset by weed control obtained.

9. **How it Works:** A systemic herbicide absorbed by leaf and stem.

10. **Expected Results:** Twisting and curling of weeds will commence 2 - 10 days after application. Growth ceases, eventually plants turn brown and die. Poor results may be expected if poor coverage or low relative humidity during and after spraying.

11. **Effects of Rainfall:** Rain within 3 or 4 hours of application may reduce control.

12. **Movement in Soil:** Leaching does not pose a problem.

13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze or harvest for livestock feed until 30 days after treatment.

14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = 2,4-D, 300 - 1,000 mg/kg, dichlorprop = 800 mg/kg. Do not spray on foraging bees. Toxic to bees. May be absorbed through the skin and may cause burns.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage**: May be stored at any temperature. Shake well after storing for 1 year or longer.

    ** **Toadflax:** Apply when the majority of the toadflax are no taller than 15 cm. The degree of suppression will vary with the size of toadflax and environmental conditions prior to and following treatment. Use of Estaprop or Turboprop for suppression of toadflax in wheat or barley is part of a long-term planned approach for toadflax control. Do not apply before the 4 leaf stage or between flag leaf to full-headed stages.

    Note: This is a minor use registration and may or may not appear on the current product label.

17. **Resistance Management:** Estaprop/Turboprop 600/SEE Diphenoprop/Dichloprop-D/Interprop is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Estaprop/Turboprop 600/SEE Diphenoprop/Dichloprop-D/Interprop and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Estaprop/Turboprop 600/ Dichlorprop-D/Desormone/ Diphenoprop 700 *(2,4-D + dichlorprop)*

Industrial

Group 4

Manufacturer: **Nufarm Canada/United Agri Products/Interprovincial Co-operatives Ltd.**

1. **Formulations:** Emulsifiable concentrate; Estaprop/Turboprop 600/Dichlorprop-D, 282 g/L 2,4-D Ester isomer specific + 300 g/L dichlorprop; Estaprop, 10 L, 114 L container; Turboprop 600, 10 L, 115 L, 400 L containers; Dichlorprop-D, 10 L.
2. **Registered Mixes:** Vanquish, fuel oil (basal, frill, stump), TCA (spruce, balsam, pine).

   Mixing instructions: Add 1/2 amount of carrier, start agitation, add herbicide, then add rest of carrier. In water, agitate to prevent separation. In oil, do not let water get into mixture.
3. **Crops:** Industrial areas, non-crop areas, rights-of-way, roadsides.

   Underseeding: Not applicable.
4. **Weeds Controlled:**

Brush:

Group 1

buckbrush
hawthorn
poplar
Scotch pine
sugar maple
wild cherry
wild plum
wild raspberry
white cedar

Group 2

alder
aspen
balsam fir
basswood
birch
blueberry
bur oak
elderberry
elm
ground juniper
hazel
hardhack
hickory
honeysuckle
Manitoba maple
poison-ivy
poplar
red pine
rose
Scotch pine
silver maple
sumac
tamarack
tame raspberry
white oak
wild apple
willow

Weeds (also weeds listed for Estaprop, Turboprop 600)

alfalfa
bull thistle
burdock
buttercup
Canada thistle
chicory
cinquefoil
curled dock
dandelion
dogbane
goat's-beard
goldenrod
hawkweed
horsetail
mullein
perennial sow-thistle
plantain
sweet clover
tansy
teasel
vetch
wild carrot
yellow rocket

5. **Weeds Suppressed:** Milkweed, toadflax.
6. **When Used:**

Brush control: Apply on foliage and stems just before or just after brush is in full leaf in late spring or early fall. Many species may require retreatment the following year.

Basal treatment (not ash or basswood): Any time of year.

Frill treatment: Standing trees more than 13 - 15 cm in diameter.

Stump treatment: Immediately after cutting.

Weeds: During May or in early fall. Some species may require a second treatment.

Estaprop/Turboprop 600/Dichlorprop-D/Desormone/Diphenoprop 700 (cont'd)

7. **How to Apply:**

   With: Power equipment, knapsack sprayer, air.

   Rate: Brush control (rate/1,000 L of water): Group 1 (see Weeds Controlled): Estaprop/Dichlorprop-D, 8.75 L; Turboprop 8.0 L. Group 2: Estaprop/Dichlorprop-D, 11.7 L; Turboprop, 11.0 L.

   Basal (not ash or basswood)(rate/100 L of fuel oil): Group 1: Estaprop/Dichlorprop-D, 3.25 L; Turboprop, 2.4 L. Group 2: Estaprop/Dichlorprop-D, 5.1 L; Turboprop 3.2 L.

   Frill/stump treatment (rate/100 L fuel oil): Estaprop/Dichlorprop-D, 3.25 L; Turboprop, 3.2 L.

   Weeds: Estaprop/Turboprop/Dichlorprop-D, 1.6 L/ac.

   Water volume:

   Ground: Brush Control 305 - 610 L/ac depending on brush density and height. Weeds 80 - 240 L/ac, spray to point of runoff.

   Pressure: As recommended for equipment used.

   Nozzles: Flat fan recommended.
8. **Application Tips:** Thoroughly wet down all foliage and stems to ground level. Do not spray during high winds or high temperatures.
9. **How it Works:** A translocated, systemic herbicide absorbed by leaves.
10. **Expected Results:** Leaves brown and wilt shortly after spraying – no leaves appear the following year.
11. **Effects of Rainfall:** Rain within 3 or 4 hours after application may reduce control.
12. **Movement in Soil:** Leaching does not pose a problem.
13. **Cropping Restrictions:**

    Grazing restrictions: No grazing restrictions specified.

    Drift: Over susceptible crops causes injury.
14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = 2,4-D, 300 - 1,000 mg/kg; dichlorprop = 800 mg/kg. Do not apply when bees are foraging. Toxic to bees. May be absorbed through the skin and may cause burns.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** If frozen, warm to 5°C and mix well.

    Note: Similar products are Desormone/Diphenoprop 700.

Everest *(flucarbazone sodium)*

Group 2

Manufacturer: **Arvesta Canada Inc.**

1. **Formulations:** Dry flowable; 70%; 696g (4 X 174g) water-soluble packets.
2. **Registered Mixes:** **Green foxtail and wild oat control in spring wheat:** Everst at 17.4 g/ac + non-ionic surfactant at 0.25 L/100 L: 2,4-D Amine or Ester, MCPA Amine or Ester, Ally** + 2,4-D Amine or Ester, Attain, Buctril M, Curtail M, DyVel, DyVel DS, Estaprop, Express Pack, Frontline, Frontline/2,4-D, Pardner, Prestige, Refine Extra** + 2,4-D Amine or Ester, Spectrum, Target*, Thumper, Unity**.

In durum wheat: 2,4-D Amine or Ester, Frontline, Spectrum.

Green foxtail control only in spring wheat: Everest at 8.7 g/ac + non-ionic surfactant at 0.25 L/100 L: 2,4-D Amine or Ester, Buctril M, Estaprop, Thumper, Refine Extra** + 2,4-D Amine.

* Reduction in wild oat control may be observed with this tank mix partner.

** Addition of a second surfactant is not required for Everest Solupak tank mixes with Ally, Refine Extra and Unity Herbicide tank mix. Use only one of the recommended surfactants from the Everest Solupak label at an application rate of 0.25% v/v (0.25 L per 100 L total spray solution).

Note: Everest must be tank mixed with a broadleaf partner for crop safety. Broadleaf tank mix partners containing 2,4-D will provide the greatest crop safety.

Non-ionic surfactants: Ag-Surf, Agral 90. L 1700, Super spreader, Surf 92. Mixing with other adjuvants is not recommended.

Mixing restrictions: Do not use packets in liquid fertilizer. Do not use packets in a tank mix with products that contain boron or release-free chlorine. The resultant reaction of water-soluble packets and boron or free chlorine is a plastic, which is not soluble in water or solvents such as diesel oils, kerosene, gasoline or alcohol.

3. Crops: Canada Prairie spring wheat, durum wheat, extra strong spring wheat, hard red spring wheat, soft white spring wheat, utility spring wheat.

Underseeding: Do not apply to spring wheat underseeded to legumes.

4. Weeds Controlled: Green foxtail (including Group 1 and 3 herbicide resistant green foxtail), wild oats (including Group 1 and 8 herbicide resistant wild oats).

5. Weeds Suppressed: None.

6. When Used:

Crop stage: 1 - 6 leaf stage (1 leaf to 4 leaves on the main stem, plus 2 tillers).

Weed stage: Green foxtail, wild oats: 1 - 6 leaf stage (1 leaf to 4 leaves on the main stem, plus 2 tillers).

7. How to Apply:

With: Ground equipment. Do not apply by air.

Rate: 17.4 g/ac. Add Agral 90 or Ag-Surf at 0.25 L per 100 L of spray solution. Green foxtail: 8.7 g/ac.

Water volume: 45 L/ac.

Pressure: 207 - 345 kPa.

Nozzles: The use of 80° or 110° flat fan nozzles is recommended for optimum spray coverage. Nozzles may be oriented 45° forward to enhance crop penetration and to give better weed coverage. In-line strainers and nozzle screens should be 50-mesh or coarser.

Mixing instructions:

1. Fill the spray tank 3/4 full with clean water and begin agitation or bypass.
2. Add the required number of unopened packets of Everest Solupak, as determined by the rate, directly to the spray tank. Depending on the water temperature and the degree of agitation, the packets should be completely dissolved within approximately 5 to 10 minutes from the time they were added to the water. Maintain sufficient agitation during both mixing and application.
3. Add the broadleaf herbicide.
4. Add the surfactant, then complete filling the tank with the balance of water needed.

Sprayer cleanup:

1. Drain the tank and thoroughly rinse spray tank, boom and hoses with clean water. Pay particular attention to flushing out any visible deposits.
2. Fill the tank with clean water and 1% v/v (1 L/100 L) household ammonia. Flush the hoses, boom and nozzles with the cleaning solution. Circulate for at least 15 minutes. Flush hoses, boom and nozzles once more, then drain the tank.
3. Clean nozzles and screens in a separate container using the ammonia and water.
4. Repeat #2.

Everest (cont'd)

5. Rinse the tank, boom and hoses with clean water.
6. Check the tank mix partner label for any additional cleanup procedures.

Do not clean sprayer near desirable vegetation, wells or other water sources. Dispose of all rinsings in accordance with provincial regulations. Check the tank mix partner label for any additional cleanup procedures.

8. **Application Tips:** Wheat exposed to the following at application time could show unacceptable injury symptoms: water-logged or saturated soils, temperature extremes such as heat or freezing weather, drought, low fertility or plant disease. Weed control may also be reduced by these same conditions. Crop tolerance and weed control may be reduced if applications are made to plants growing under stress. Stress includes saturated or water logged soil, drought, extreme temperatures, low fertility or visible disease symptoms at application. Adopting practices to increase crop vigour will improve crop tolerance.
9. **How it Works:** Flucarbazone-sodium is a systemic herbicide that is absorbed by both leaves and roots and moves rapidly to the growing point of the plant.
10. **Expected Results:** Growth of susceptible plants stops soon after application. Symptoms include discolouration (yellowing, reddening and purpling), and complete control may take 1 to 2 weeks.
11. **Effects of Rainfall:** Do not apply if rainfall is expected in 1 hour after application.
12. **Movement in Soil:** None.
13. **Cropping Restrictions:** The following crops may be planted 11 months after application:

Black soil zone: Barley, canola (all varieties), field bean, field peas*, flax, spring wheat.

Brown soil zone: Spring wheat.

Dark Brown soil zone: Barley, canola (all varieties), field peas*, flax, spring wheat.

Grey-Wooded soil zone: Barley, canola (all varieties), field peas*, spring wheat.

* Field peas may be grown the year following an Everest application where precipitation has been equal to or above the 10 year average (during the growing season of the year of application) and where organic matter content is above 4% and soil pH is below 7.5.

Rotational crops can be adversely affected if rainfall is below normal (10 year average) during the year of application. Use certified seed and good agronomic practices to reduce the effect on rotational crops.

Everest applications to eroded knolls in the Dark Brown and Black soil zones with low organic matter (less than 2%) and high pH (greater that 7.5) or to Grey-Wooded soils with highly variable soil texture and organic matter may result in delayed development or reduced yield of rotational crop.

Grazing restrictions: Do not feed or graze treated fields. Wheat grain or straw from treated fields may be fed to livestock.

Other restrictions: Observe minimum interval to harvest of 80 days after treatment.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a cool, dry place and in such a manner as to prevent cross contamination with other pesticides, fertilizers, food, or feed. Store in original container and out of reach of children, preferably in a locked storage area. Everest Solupak is not affected by freezing. Avoid physical damage to Everest Solupak water-soluble packets during storage and prior to mixing in spray tank.
17. **Resistance Management:** Everest is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Everest and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Express Pack *(tribenuron methyl)*

Group 2

Manufacturer: DuPont Canada Inc.

CAUTION POISON

1. **Formulations:** Dry flowable, 75%, 160 g container Express packaged with 10 L jug 2,4-D Ester LV 700.
2. **Registered Mixes:** Express herbicide must be tank mixed with 2,4-D. Do not use Express alone. 2,4-D Ester LV 700 (240 mL/ac - 323 mL/ac), Assert + 2,4-D Ester LV 700 (spring and durum wheat), Banvel II + 2,4-D Ester LV 700 (spring wheat and barley), Puma¹²⁰ Super + 2,4-D Ester LV 700 (spring wheat, durum wheat and barley).

   Mixing instructions: Add 1/3 required amount of water. While agitating, add Express and ensure it is completely suspended. Add 2,4-D Ester. Complete filling. Antifoaming agents may be required. For repeat tank loads, reduce remaining mixture to 10% of original spray volumes or pre-slurry Express.
3. **Crops:** Barley, durum wheat, spring wheat, summerfallow.

   Underseeding: Do not apply to wheat and barley underseeded to legumes or grasses.
4. **Weeds Controlled:** Express and 2,4-D Ester

   annual sunflower
   ball mustard (8.6)
   cow cockle (8.9)
   flixweed
   hare's-ear mustard (8.6)
   Indian mustard (8.6)
   kochia (2 - 10 leaf) (8.1)
   lamb's-quarters (8.2)
   narrow-leaved hawk's-beard
   prickly lettuce
   redroot pigweed (8.6)
   Russian pigweed
   Russian thistle (8.5)
   shepherd's-purse
   stinkweed (8.9)
   sweet clover
   thyme-leaved spurge
   tumble mustard (8.6)
   wild mustard (8.6)
   wild radish
   wormseed mustard (8.6)

   Express + 2,4-D Ester + Assert: All weeds controlled by Express Pack plus wild oats.

   Express + 2,4-D + Banvel II: All weeds controlled by Express Pack plus sulfonyurea resistant kochia.

   Express + 2,4-D Ester + Puma¹²⁰ Super: All weeds controlled by Express Pack plus green foxtail.
5. **Weeds Suppressed:** Canada thistle (top growth control) (6.9), wild buckwheat (1 - 3 leaf) (8.1).
6. **When Used:**

   Crop stage: Barley, spring wheat (including durum): 3 leaf expanded to just before the flag leaf stage (shot blade). Do not apply after the head has emerged.

   Weed stage: Apply to young, emerged actively growing weeds that are less than 10 cm tall or across and before the crop canopy closes.

   Summerfallow (control of fall rosettes and spring seedlings of shepherd's-purse, narrow-leaved hawk's-beard, flixweed and stinkweed): Apply the tank mix in the spring after emergence, up to the early flowering stage. Only weeds that have emerged at the time of application will be controlled.
7. **How to Apply:**

   With: Ground equipment. Do not apply by air.

   Rate:

Tank mixes	Express (g/ac)	2,4-D Ester LV 700 (mL/ac)	Assert (mL/ac)	Banvel (mL/ac)	Puma¹²⁰ Super (mL/ac)
Express Pack alone	4	250	–	–	–
Express Pack plus Assert	4	250	500 - 670	–	–
Express Pack plus Banvel II	4	250	–	45	–
Express Pack plus Puma ¹²⁰ Super	4	250	–	–	156

Express Pack (cont'd)

Water volume: 40 L/ac.

Pressure: 210 - 275 kPa.

Nozzles: Use flat fan nozzles. Do not use flood jet nozzles. Use 50 mesh screens or larger.

Sprayer cleanup: To avoid injury to susceptible crops, clean sprayer thoroughly immediately after spraying. Ammonia must be used to deactivate Express when cleaning equipment. Use the following procedure:

1. Drain tank; then flush tank, boom and hoses with clean water for a minimum of ten minutes to remove all visible residues.
2. Fill the tank with clean water, then add 1 litre household Ammonia (containing a minimum of 3% ammonia) per 100 litres of water. (Do not use ammonia with chlorine bleach). Fill boom and hoses with solution and allow sprayer to sit for 15 minutes. Drain.
3. Repeat step 2.
4. Nozzles and screens should be removed and cleaned separately. To remove traces of ammonia, rinse the tank, hoses and booms thoroughly with clean water.
5. Dispose of tank rinseate according to Provincial directions. **Note:** It is difficult to remove all traces of 2,4-D Ester from a sprayer. Therefore, take extra precautions when spraying crops sensitive to 2,4-D Ester immediately following a 2,4-D Ester application.

8. **Application Tips:** Wild oat herbicides require a 4 - 5 day interval before or after an application of Express. Effectiveness may be reduced if spray mixture remains in tank for more than 24 hours. When tank mixed with Assert, apply within 12 hours of mixing.
9. **How it Works:** Absorbed by foliage and roots, inhibits cell elongation.
10. **Expected Results:** Express stops growth of susceptible weeds immediately. However, typical systoms (discolouration) of dying weeds may not be noticeable for 1 - 3 weeks after application, depending on growing conditions and weed susceptibility. Degree of control and duration of effect depend on weed sensitivity, weed size, spray coverage and growing conditions. Favorable growing conditions following treatment promote the activity of Express while cold, dry conditions delay the activity.
11. **Effects of Rainfall:** If rain occurs soon after application, control may be reduced. 4 - 6 hours of dry weather are needed to allow Express to be absorbed by weed foliage.
12. **Movement in Soil:** Express moves little in the soil. Its life in the soil is very short.
13. **Cropping Restrictions:**

    Grazing restrictions: Wheat or barley may be grazed or cut for hay 7 days after application. A minimum recropping interval of 2 months should be left between the application of Express and seeding of the next crop. The following crops can be seeded after 2 months: canola, flax, lentils, alfalfa.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg. May irritate eyes, nose, throat and skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place.
17. **Resistance Management:** Express Pack is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Express Pack and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Express Toss-N-Go *(tribenuron methyl)*

Group 2

Manufacturer: DuPont Canada Inc.Dd

1. **Formulations:** Dry flowable, 75%, 160 g container Express.
2. **Registered Mixes:** Round-Up Original, Round-Up Transorb, Round-Up Dry or Touchdown 600.

   Mixing instructions: Add 1/3 required amount of water. While agitating, add Express and ensure it is completely suspended. Add the appropriate amount of tank mix partners. Once components are in suspension, add Agral 90. Complete filling. Anti-foaming agents may be required. For repeat tank loads, reduce remaining mixture to 10% of original spray volumes or pre-slurry Express.
3. **Crops:** Pre-seed burn-off, summerfallow.
4. **Weeds Controlled:** Express and registered glyphosate.

   - canola
   - dandelion
     - top growth control
   - green foxtail
   - kochia
   - lady's- thumb
   - lamb's-quarters
   - stinkweed
   - volunteer barley
   - volunteer wheat
   - wild buckwheat
   - wild mustard
   - wild oats
5. **Weeds Suppressed:** Canada thistle, narrow-leaved hawk's beard , redroot pigweed, Russian thistle.
6. **When Used:**

   Crop stage: Spring wheat, durum or barley can be seeded 24 hours after application.

   Weed stage: Apply to young, emerged actively growing weeds that are less than 10 cm tall or across and before the crop canopy closes.

   Summerfallow: (control of fall rosettes and spring seedlings of narrow-leaved hawk's-beard and stinkweed) Apply the tank mix in the spring after emergence, up to the early flowering stage. Only weeds that have emerged at the time of application will be controlled.
7. **How to Apply:**

   With: Ground equipment. Do not apply by air.

   Rate: 4 g/ac of Express Toss-N-Go, 0.4 l/ac registered glyphosate.

   Surfactant: 3.5 L/1,000 L of solution.

   Water volume: 40 L/ac.

   Pressure: 210 - 275 kPa.

   Nozzles: Use flat fan nozzles. Do not use flood jet nozzles. Use 50 mesh screens or larger.

   Sprayer cleanup: To avoid injury to susceptible crops, clean sprayer thoroughly immediately after spraying. Ammonia must be used to deactivate Express Toss-N-Go when cleaning equipment. Use the following procedure:

   1. Drain tank; then flush tank, boom and hoses with clean water for a minimum of 10 minutes to remove all visible residues.
   2. Fill the tank with clean water, then add 1 litre household ammonia (containing a minimum of 3% ammonia) per 100 litres of water. (Do not use ammonia with chlorine bleach). Fill boom and hoses with solution and allow sprayer to sit for 15 minutes. Drain.
   3. Repeat step 2.
   4. Nozzles and screens should be removed and cleaned separately. To remove traces of ammonia, rinse the tank, hoses and booms thoroughly with clean water.
   5. Dispose of tank rinseate according to provincial directions.

Express Toss-N-Go (cont'd)

8. **Application Tips:** Effectiveness may be reduced if spray mixture remains in the tank for more than 24 hours.
9. **How it Works:** Absorbed by foliage and roots, inhibits cell elongation.
10. **Expected Results:** Express stops the growth of susceptible weeds immediately. However, typical systems (discolouration) of dying weeds may not be noticeable for 1 - 3 weeks after application, depending on growing conditions and weed susceptibility. Degree of control and duration of effect depend on weed sensitivity, weed size, spray coverage and growing conditions. Favorable growing conditions following treatment promote the activity of Express while cold, dry conditions delay the activity.
11. **Effects of Rainfall:** If rain occurs soon after application, control may be reduced; 4 hours of dry weather are needed to allow Express Toss-N-Go to be absorbed by weed foliage.
12. **Movement in Soil:** Express Toss-N-Go moves little in the soil. Its life in the soil is very short.
13. **Cropping Restrictions:** A minimum recropping interval of 2 months should be left between the application of Express and seeding of canola, flax, lentils, alfalfa.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD50 (rats) = >5,000 mg/kg. May irritate eyes, nose, throat and skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place.
17. **Resistance Management:** Express Toss-N- Go is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Express Toss-N- Go and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

FlaxMax

(sethoxydim + clopyralid + MCPA Ester)

Group 1,4

Manufacturer: BASF Canada

CAUTION POISON

1. **Formulations:**

    Poast Ultra: 450 g/L, 3.65 L.

    FlaxMax: 50 g/L clopyralid + 280 g/L. MCPA Ester: 2 x 8.1 L.

    Merge: 8.1 L.
2. **Registered Mixes:** None.
3. **Crops:** Flax (excluding low linolenic acid varieties).

4. Weeds Controlled:

Weed species	Leaf stage	Poast Ultra (mL/ac)	FlaxMax (mL/ac)	Merge (mL/ac)
Annual grasses Barnyard grass, crabgrass (large), fall panicum, green foxtail, Persian darnel, proso millet, volunteer corn, wild millet, witchgrass, yellow foxtail	1 - 6	130	607	304
Wild oats and volunteer cereals Volunteer barley, volunteer wheat, wild oats	1 - 4			
Annual broadleaf weeds Flixweed, lamb's-quarters, shepherd's-purse, stinkweed, volunteer sunflower, wild mustard	2 - 4*			
Perennial weeds Canada thistle** (light infestations), common groundsel	10 cm to early bud stage			
Annual grasses Barnyard grass, crabgrass (large), fall panicum, green foxtail, Persian darnel, proso millet, volunteer corn, wild millet, witchgrass, yellow foxtail	1 - 6	190	810	405
Wild oats and volunteer cereals Volunteer barley, volunteer wheat, wild oats	1 - 6			
Annual broadleaf weeds Annual sow-thistle, common groundsel, flixweed, lamb's-quarters, redroot pigweed, Russian pigweed, scentless chamomile, shepherd's-purse, smartweed, stinkweed, tartary buckwheat, volunteer canola, volunteer sunflower, wild buckwheat, wild mustard	2 - 4*			
Perennial weeds Dandelion	Spring rosette stage	190	810	405
Perennial weeds Perennial sow-thistle	Top growth	190	810	405
Perennial weeds Canada thistle (medium to heavy infestations)	10 cm to early bud stage			

* Treatments made to broadleaf weeds after the 4 leaf stage may result in less than satisfactory control.

** Spring-long control with potential regrowth in the fall.

Note: Some delay in crop maturity and crop injury may result from the use of the high rate, but any potential yield reductions will usually be offset by increased yields due to better weed control.

FlaxMax (cont'd)

5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Flax: 5 - 15 cm tall. Early spraying will reduce the risk of crop injury.

   Weed stage: (see weed control chart above).
7. **How to Apply:**

   With: Ground equipment.

   Rate:

Poast Ultra	FlaxMax	Merge
130 - 190 mL/ac	607 - 809 mL/ac	304 - 405 mL/ac

   Water volume: 40 - 60 L/ac.

   Pressure: 200 - 275 kPa.

   Nozzles: Flat fan nozzles tilted 45° forward preferred. The use of flood jet or hollow cone nozzles is not recommended because of uneven and inadequate spray coverage.
8. **Application Tips:** Early spraying will reduce the risk of crop injury. Ensure thorough and uniform spray coverage over the entire leaf area of the target weeds. When weeds are stressed due to drought, flooding or prolonged hot or cool temperatures (15°C or less), control can be reduced or delayed since weeds are not actively growing. Weed escapes may occur under prolonged stress conditions or low fertility. Do not make applications to weeds stressed longer than 20 days due to lack of moisture as unsatisfactory control can result. Ensure thorough and uniform spray coverage over the entire leaf area of the target weeds. Do not apply FlaxMax herbicide directly to or otherwise permit it to come into contact with sunflowers, legumes, fruit or vegetable crops, flowers or other desirable broadleaf plants, and take precautions to avoid spray mists drifting onto them. Equipment used to apply FlaxMax herbicide should not be used to apply other pesticides to sensitive crops without thorough cleaning.
9. **How it Works:** Poast is a contact and systemic herbicide. Uptake is primarily through the leaves and thorough coverage of foliage is important for consistent control. Susceptible annual grasses stop growing and slowly turn brown. Complete control takes 7 - 21 days. Clopyralid is a growth regulator type of herbicide, which is primarily absorbed through the foliage and is translocated to all parts of the plant causing leaves and stems to twist, yellow and then die. MCPA is a systemic herbicide for broadleaf weeds that is translocated throughout the plant causing rapid undifferentiated growth, which usually results in the death of susceptible weeds.
10. **Expected Results:**

    Grasses: Susceptible annual grasses stop growing and slowly turn brown. Complete control takes 7 - 21 days.

    Broadleaf weeds: Weeds start to twist after spraying; after twisting and bending, plants turn brown and die.

    Difficult to control weeds such as Canada thistle and wild buckwheat stop growing, change colour to dark green and then turn yellow before they die. Death may not occur for 14 - 21 days after application. Some weak Canada thistle regrowth may occur by the end of the season.
11. **Effects of Rainfall:** Do not apply if rain is forecast within 6 hours of application.
12. **Movement in Soil:** Poast is relatively immobile in the soil and breaks down quickly. Clopyralid is somewhat soluble in water, but is generally not mobile in soil under typical prairie conditions. MCPA is readily leached from the soil.

13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze treated fields of flax within less than 7 days after application.

    Succeeding crops: Fields previously treated with FlaxMax herbicide can be seeded to wheat, barley, oats, rye, corn, flax, canola, sugar beets, mustard or should be summerfallowed. Field peas can be grown the following year (10 months after applicaiton). Do not seed to crops other than those listed above for at least one clear year following treatment.

14. **Toxicity:**

    Poast: Low acute mammalian toxicity. Acute LD_{50} (rats) = 2,500 mg/kg. Clopyralid: Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = >2,000 mg/kg. Acute oral LD_{50} (bees) = >100 μg/bee. Extremely low toxicity to fish.

    MCPA: Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 700 - 880 mg/kg. Low toxicity to fish. May cause burns upon contact with skin and eyes, and it can be absorbed through the skin.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear overalls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in original, tightly-closed container and do not allow water to be introduced into this container. Store in cool (above 5°C), dry and well ventilated area. If product is frozen, bring to room temperature and agitate before use.

17. **Resistance Management:** FlaxMax is both a Group 1 and a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to FlaxMax and other Group 1 and 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Fortress *(triallate + trifluralin)*

Group 8,3

Manufacturer: **Monsanto Canada Inc.**

1. **Formulations:** Granular; 10% triallate + 4% trifluralin; 22.7 kg bag.
2. **Registered Mixes:** None.
3. **Crops:** Barley (8.9), flax (8.0), durum wheat (9.0), mustard (9.0), rapeseed (9.0) (including canola), spring wheat (8.2).
4. **Weeds Controlled:** Green foxtail (7.1), wild oats (7.3), yellow foxtail.
5. **Weeds Suppressed:** Kochia, lamb's-quarters, redroot pigweed, Russian thistle, wild buckwheat.
6. **When Used:**

    Spring: Pre-plant incorporated on barley, flax, spring and durum wheat and rapeseed (including canola). Do not apply pre-plant with wheat in soils with 0 - 4% organic matter.

    Fall: Apply in fall, after September 15 until soil freeze-up. Do not apply preplant with wheat in soil with less than 2% organic matter.

    Note – Fall applications: Where erosion may be a problem, maximize crop residue cover with only one fall tillage incorporation.

Fortress (cont'd)

7. How to Apply:

With: Aircraft or ground equipment.

Rate:

Fall Granular Fortress Rates (kg/ac)

	Organic matter				
Crops	**Less than 2%**	**2 - 4 %**	**4 - 6 %**	**Greater than 6%**	**Greater than 8%**
Barley	4.5	5.7	5.7	6.9	6.9
Durum wheat, sping wheat	–	4.5	5.7	5.7	6.9
Flax, mustard, rapeseed	5.7	5.7	5.7	6.9	6.9

Spring Granular Fortress Rates (kg/ac)

		Organic matter				
Crops	**Application timing**	**Less than 2%**	**2 - 4 %**	**4 - 6 %**	**Greater than 6%**	**Seeding depth (cm)**
Barley	Before seeding	–	4.5	5.7	6.9	5 - 7.5
Durum wheat, sping wheat		–	–	4.5	5.7	5 - 7.5
Flax, mustard, rapeseed		5.7	5.7	6.9	6.9	as desired

Fall Surface Granular Fortress Rates (kg/ac)

	Organic matter				
Crops	**Less than 2%**	**2 - 4 %**	**4 - 6 %**	**Greater than 6%**	**Seeding depth (cm)**
Barley	4.5	5.7	5.7	6.9	5 - 7
Durum wheat, sping wheat	–	4.5	5.7	5.7	5 - 7
Flax, mustard, rapeseed	5.7	5.7	5.7	6.9	as desired

Incorporation:

Time: First incorporation within 24 hours, second incorporation can be either in the fall or spring.

Implement: Use a double disc or light duty cultivator plus harrows. Harrowing does not provide effective incorporation if compacted soil prevents penetration of harrow teeth, if trash accumulates in harrow section or if harrows bounce.

8. Application Tips:

Calibrate equipment to deliver desired amount of product. Use only a hoe-drill or a double disc press drill to seed barley or wheat into a Fortress-treated field. Do not apply to soil with less than 2% organic matter if it is to be seeded to wheat. Do not apply Fortress for wheat on land that has been treated with trifluralin since June 1 of the previous year.

Seeding: Flax, mustard and rapeseed can be seeded in treated layers. Barley and wheat are more sensitive and should be planted 6.0 - 7.5 cm. Wheat must be seeded at least 1.0 cm below the treated layer. Do not seed deeper than 7.5 cm. To ensure an even crop stand, increase the usual seeding rate of barley and wheat by 10%. Seed into warm, moist seedbed.

Fall surface application: Where fields are prone to water and/or wind erosion and fall tillage is therefore undesirable, fall surface applications should be made after October 15 or within three weeks of soil freeze-up (average soil temperature at the 5 cm depth should be 4°C or less). Fall surface application should be made to standing stubble, chemical fallow or summerfallow fields in a state of low soil erodibility. Avoid smooth, hard packed soil conditions in summerfallow which may allow granules to drift. Surface applications should not be made to fields covered in snow or that have excessive crop residue, which will not allow granules contact with soil. Under excessively warm and/or wet conditions between application and crop emergence, control may be reduced. For best results under heavy wild oat infestations, use the incorporated treatments only.

9. **How it Works:** Absorbed by wild oat shoots and foxtail roots, usually resulting in death before emergence. Under dry conditions, some wild oats and foxtail may emerge before being killed.

10. **Expected Results:**

    Weeds: Wild oats and foxtail die before they emerge. Weed control may be reduced under conditions of prolonged, cool soil temperatures at the time of germination or extreme drought in spring.

    Crops: Thinning in barley and wheat are known to occur under conditions of heavy rainfall and/or cold weather after application and before crop emergence. In most cases, thinning is more than offset by tillering. Some thinning may be noted on eroded knolls. Poor results may be expected if there is incomplete incorporation due to wet, cloddy soil or heavy trash, very dry soil conditions in spring or prolonged cool soil temperatures at time of germination. Ridges left by seeding may disrupt the treated layer and allow escapes.

11. **Effects of Rainfall:** Moisture is required for activation. Rainfall of at least 1.5 cm within 2 weeks of application in the spring is required to ensure maximum performance.

12. **Movement in Soil:** Negligible.

13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

    Succeeding crops: Under normal conditions, Fortress carryover will not harm crops grown in rotation. As a precaution, domestic oats, sugar beets, creeping red fescue and small-seeded grasses such as timothy and canary seed should not be grown in rotation following a Fortress-treated crop.

14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg. May cause skin and eye irritation.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a dry place.

17. **Resistance Management:** Fortress is both a Group 3 and a Group 8 herbicide. Any weed population may contain or develop plants naturally resistant to Fortress and other Group 3 and 8 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Freedom Gold *(thifensulfuron methyl + quizalofop-p-ethyl)*

Groups 1,2

Manufacturer: **DuPont Canada Inc.**

CAUTION POISON

1. **Formulations:**

   1. Freedom (dry flowable): 75%; 320 g canister.
   2. Assure II (emulsifiable concentrate): 96 g/L; 1 x 8 L.
   3. 1 jug Sure-Mix (adjuvant): 1 x 8 L.

Freedom Gold (cont'd)

2. **Registered Mixes:** Lontrel (170 mL/ac).

Mixing instructions:

1. Fill tank with 1/2 - 3/4 amount of required water with agitator running.
2. Add the required amount of Freedom herbicide and ensure it is completely in suspension.
3. Add required amount of Assure II and continue agitating.
4. Add remainder of water, then add the Sure-Mix (adjuvant). Continuous agitation is required.

3. **Crops:** Registered on the following CLEARFIELD varieties: 45A71, 46A73, 46A74, 46A76.

4. **Weeds Controlled:**

barnyard grass
chickweed*
corn spurry
cow cockle
green foxtail
green smartweed
hemp-nettle
lady's-thumb (smartweed)
lamb's-quarters
redroot pigweed
Russian thistle
stinkweed
volunteer barley
volunteer corn
volunteer oats
volunteer rapeseed
(excluding CLEARFIELD canola)
volunteer wheat
wild buckwheat**
wild mustard
wild oats

* Apply when the chickweed is small (1 - 6 leaf) and actively growing.
** Wild buckwheat: 1 - 3 leaf stage.

5. **Weeds Suppressed:** Kochia, quackgrass.

6. **When Used:**

Crop stage: 3 - 6 leaf stage of CLEARFIELD canola. Application of 46A76 should not be made prior to the full 4 leaf stage.

Weed stage: Annual grassy weeds: 2 leaf to early tillering stage. Best results on wild oats if application is made prior to tillering.

Quackgrass: 2 - 6 leaf stage.

Broadleaf weeds: Less than 10 cm tall or across. May apply Assure II and Sure-Mix from the Freedom Gold pack prior to the 3 leaf stage. Follow up with an application of Freedom Gold plus recommended non-ionic surfactant at 2 L/1,000 L of water (1 L/100 gal of water) once the canola has reached the **full 3 leaf stage**.

7. **How to Apply:**

With: Ground equipment only. Do not apply by air.

Rate: Assure II 200 mL/ac + Freedom 8 g/ac + 5 L of Sure-Mix per 1,000 litres of spray solution. Follow mixing instructions above.

Water volume: Minimum of 40 L/ac.

Pressure: 210 - 275 kPa.

Nozzles: Use flat fan nozzles. Do not use flood jet nozzles. Use 50 mesh screens or larger.

Sprayer cleanup: To avoid injury to susceptible crops, clean sprayer thoroughly immediately after spraying. When cleaning equipment, ammonia must be used to deactivate Freedom.

1. Drain and flush tank, boom and hoses with clean water for a minimum of ten minutes. Visually inspect the tank to ensure the removal of all visible residues of Freedom. If necessary, repeat step 1.
2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum of 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, then add more water and ammonia to completely fill tank so that all surfaces are in contact with the solution. Allow to sit for 15 minutes with agitation. Again, flush the hoses, booms and nozzles with the cleaning solution and drain the tank.
3. Remove nozzles and screens, and clean them separately in bucket containing cleaning agent and water.
4. Repeat step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips:** Under dry conditions, control may be reduced. Large plants may regrow after treatment. When very high weed seedling population occurs, larger seedlings may interfere with coverage of smaller seedlings, and control may be reduced. Regrowth may also occur if crop competitiveness is reduced by thin stands and/or reduced vigour. Do not apply Freedom Gold to plants that have been stressed prior to application by severe weather conditions, frost, low fertility, drought, water saturated soil, disease or insect damage as crop injury may result. Do not apply if the above stress conditions are expected within 3 days after application as crop injury may result.
9. **How it Works:** Assure II is a systemic herbicide that is rapidly absorbed and readily translocated from the treated foliage to the root system and growing points of the plant. Freedom is absorbed by the foliage and roots. It inhibits cell elongation.
10. **Expected Results:** Broadleaf weed growth stops almost immediately. Grassy weeds show a reduction in growth and a loss of competitiveness. An early yellowing or browning of the younger plant tissues is followed by a progressive collapse of the remaining foliage. These signs will generally be observed in 1 - 3 weeks, depending on the grass species treated and the environmental conditions. Poor results may be expected with improper mixing, timing or coverage or when weeds are under stress including from drought or frost.
11. **Effects of Rainfall:** If rainfall occurs soon after application, control may be reduced. Four to six hours of dry weather are needed to allow Freedom Gold to be absorbed by weed foliage. Environmental conditions that slow the drying of Freedom Gold on the foliage, such as high relative humidity, cool air temperature or cloud cover, may increase the time required for absorption.
12. **Movement in Soil:** Movement is restricted by finely textured soils, soil organic matter and neutral to acidic conditions. Product is relatively immobile in most agricultural soils.
13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze treated fields or harvest for forage or hay. Do not harvest within 64 days of treatment.

    Minimum crop rotation guidelines: Wheat or barley can be replanted any time after application. Wait 30 days after application to plant any crop other than wheat or barley.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place, but not below 5°C.
17. **Resistance Management:** Freedom Gold is both a Group 1 and a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Freedom Gold and other Group 1 and 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Frontline *(florasulam + MCPA Ester)*

Group 2,4

Manufacturer: **DowAgroSciences Canada Inc.**

CAUTION POISON

1. **Formulations:** Frontline A: Florasulam 50 g/L SC 1.6 L jug. Frontline B: MCPA Ester 500 g/L EC 13.4 L jug.
2. **Registered Mixes: Barley, durum wheat, spring wheat:** Assert 300 SC (670 mL/ac) + acidulate, Puma^{120} Super (312 mL/ac for barnyard grass, green foxtail and wild oats).
   Durum wheat, spring wheat: Everest, 70 DF solupak (17.4/ac) + non-ionic surfactant, Horizon (95 mL/ac) + Score adjuvant.
3. **Crops:** Barley, oats, spring wheat (including durum).
4. **Weeds Controlled:**

- ball mustard
- chickweed (8.7)
- cleavers (8.8)
- common ragweed
- flixweed
- hemp-nettle (7.8)
- lamb's-quarters (8.9)
- redroot pigweed (8.4)
- shepherd's-purse
- smartweed (8.6)
- stinkweed (8.9)
- volunteer canola (8.9) (all canola)
- wild buckwheat (8.2)
- wild mustard

5. **Weeds Suppressed:**

- annual sow-thistle (8.1)
- Canada thistle (6.4) (top growth control)
- dandelion (seedlings (6.6) and overwintered rosettes less than 15 cm)
- perennial sow -thistle (7.5) (top control only)
- stork's-bill (8.0)

6. **When Used:**

Crop stage: Apply to actively growing barley, oats or spring wheat. Apply when the majority of the crop is past the 2 leaf stage and up to the 6 leaf stage. When tank mixing, always check the tank mix partner(s) recommendations for crop staging restrictions.

Weed stage: 2 - 4 leaf stage.

7. **How to Apply:**

With: Ground equipment only. With a sprayer that can apply 40 L/ac spray solution. Do not apply by air.

Rate: Frontline A (florasulam): 40 mL/ac, Frontline B (MCPA Ester): 335 mL/ac.

Water volume: 40 L/ac.

Pressure: Use low pressures 200 to 275 kPa.

Nozzles: Use nozzles that deliver higher volumes and coarser droplets. Use 40 L/ac of spray solution.

Mixing instructions: Only use sprayers that have good agitation. Ensure the sprayer is properly cleaned prior to adding Frontline.

1. Fill the sprayer tank 1/2 full with water.
2. Start the sprayer agitation and continue agitation throughout mixing and spraying procedure.
3. Add Frontline A herbicide to the spray tank followed by Frontline B. Add the required tank mix partner and the adjuvant recommended for that partner. Complete the filling of the spray tank.

Sprayer cleanup:

1. Immediately after application, drain the sprayer.
2. Rinse the inside of the tank with clean water and flush through the booms and hoses using at least 10% of the spray tank volume and then drain spray tank completely.
3. Add 1 liter of household ammonia per 100 L of water while filling the tank with clean water. Agitate and then briefly flush the boom and hoses with the cleaning solution. Top up the tank with water and allow it to stand for 15 minuets with agitation. Flush boom and hoses, and drain the tank completely.
4. Remove nozzles and screens and clean separately with ammonia solution (100 mL/10 L water).
5. Rinse the tank with clean water, and flush through the booms using at least 10% of the spray tank volume and then drain the tank.

8. **Application Tips:** Do not apply to crops underseeded to legumes. Apply Frontline early post-emergence, to the main flush of broadleaf weeds. Warm moist conditions that promote active weed growth, small weed size and competitive crop and good growing conditions after application will optimize the weed control.Weeds hardened off by cold weather or drought stress may not be adequately controlled or suppressed, and regrowth may occur. For best results, ensure adequate spray coverage of the target weeds. Only weeds that are emerged at time of application will be controlled. If the foliage of the weed is wet at the time of application, control may be reduced.

9. **How it Works:** Frontline tank mix is readily absorbed by the weed foliage. The florasulam inhibits the ALS enzyme in plants, resulting in a rapid halt in growth followed by yellowing and reddening of the foliage, followed by the death of susceptible weeds. The MCPA portions of Frontline mimic naturally occurring plant hormones and control the weeds by disrupting normal plant growth patterns.

10. **Expected Results:** Weeds susceptible to Frontline A will stop growing almost immediately. The weeds turn yellow or reddish. Symptoms such as yellowing and red colouration may not be noticeable for 1 - 2 weeks. Some twisting may also be observed on weeds sensitive to MCPA. Warm moist conditions, small weed size and competitive crop will optimize weed control provided by Frontline.

11. **Effects of Rainfall:** Heavy rainfall immediately after application may wash the chemical off the foliage, and a repeat treatment may be required. Do not apply if rainfall is forecast for the time of application.

12. **Movement in Soil:** Frontline A is not persistent in soil. Dissipation of florasulam occurs primarily through microbial degradation. Field studies in a wide-variety of soils have shown the half-life of florasulam in soil to range from 2 - 18 days. Florasulam degradation is not affected by soil type or by soil pH, but is moisture and temperature-dependent. The herbicide is somewhat soluble in water, but is generally not mobile in soil under typical prairie conditions. Frontline B (MCPA Ester) is readily leached from soil.

13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze treated crop or cut for feed within 7 days of application.

    Drift: Do not allow spray mist to drift since drift can cause damage to non-target crops and plants. Do not apply when winds are gusty or in excess of 15 km/h. When spraying, avoid combinations of pressure and nozzle type that will result in fine particles (mist), which are more likely to drift.

    Succeeding crops: Fields treated with Frontline herbicide tank mix can be seeded the following year to barley, canola, peas, wheat or summerfallowed. Do not seed crops other than those listed above for at least one year after treatment. For more cropping and use information, contact your Dow AgroSciences Canada Inc. representative.

    Other restrictions: Do not harvest the treated mature crop within 60 days of application.

14. **Toxicity:** Frontline A has extremely low acute toxicity. Acute LD_{50} = >6,000 mg/kg. Frontline B has moderate acute toxicity. Acute LD_{50} of technical = 700 - 800 mg/kg.

15. **Precautions, First Aid:** Do not get in eyes, on skin or on clothing. Wear impervious gloves, coveralls and chemical workers' goggles during the mixing and handling of Frontline. Wash thoroughly after handling. Wash contaminated clothes before reuse. Destroy contaminated shoes and leather articles.

16. **Storage:** Store away from food, feedstuff, fertilizer, seeds, insecticides, fungicides or other pesticides or herbicides. Store in a dry, heated storage. If products are frozen, bring to room temperature and agitate before use. Soak up small amounts of spill with absorbent clays.

17. **Resistance Management:** Frontline is both a Group 2 and a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Frontline and other Group 2 and 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Frontline 2,4-D *(florasulam + 2,4-D)*

Group 2,4

WARNING POISON

Manufacturer: Dow AgroSciences Canada Inc.

1. **Formulation:** Florasulam SC: 50 g/L, 1.6 L jug; 2,4-D Ester LV 600 (564 g/L); 2 x 8.0 L jugs.
2. **Registered Mixes: Durum wheat, spring wheat:** Everest 70 DF solupak (17.4 g/ac) + non-ionic surfactant.
3. **Crops:** Durum wheat, spring wheat.
4. **Weeds Controlled:**

annual sow-thistle
annual sunflower
ball mustard
bluebur
burdock
chickweed
cleavers
cocklebur
common ragweed
dandelion*
flixweed
kochia
lady's-thumb
lamb's-quarters
plantain
prickly lettuce
redroot pigweed
Russian thistle
shepherd's-purse
smartweed
stinkweed
stork's-bill
tartary buckwheat
vetch
volunteer canola**
wild buckwheat
wild mustard
wild radish

* Seedlings will be controlled.
** All types of volunteer canola including herbicide tolerant.

5. **Weeds Suppressed:**

Canada thistle*
dandelion**
hemp-nettle
perennial sow-thistle*

* Top growth control only.
** Rosettes greater than 6" (15 cm) will be suppressed.

6. **When Used:**

Crop stage: Apply to actively growing durum wheat or spring wheat. Apply when the majority of the crop is in the late 3 leaf stage up to the 6 leaf stage. When tank mixing, always check the tank mix partner(s) recommendations for crop staging restrictions.

7. **How to Apply:**

With: Ground equipment only. With a sprayer that can apply 40 L/ac of spray solution. Do not apply by air.

Rate: Florasulam SC: 40 mL/ac. 2,4-D Ester LV 600: 405 mL/ac.

Water volume: 40 L/ac.

Pressure: Use low pressures 200 to 275 kPa.

Nozzles: Use nozzles that deliver higher volumes and coarser droplets.

Mixing instructions: Only use sprayers that have good agitation. Ensure the sprayer is properly cleaned prior to adding Frontline 2,4-D.

1. Fill the sprayer tank 1/2 full with water.
2. Start the sprayer agitation and continue agitation throughout mixing and spraying procedure.
3. Add Florasulam SC herbicide to the spray tank followed by 2,4-D herbicide. Complete the filling of the spray tank.

Sprayer cleanup:

1. Immediately after application, drain the sprayer.
2. Rinse the inside of the tank with clean water, and flush through the booms and hoses using at least 10% of the spray tank volume, and then drain spray tank completely.
3. Add 1 liter of household ammonia per 100 L of water while filling the tank with clean water. Agitate and then briefly flush the boom and hoses with the cleaning solution. Top up the tank with water and allow it to stand for 15 minuets with agitation. Flush boom and hoses, and drain the tank completely.

4. Remove nozzles and screens, and clean separately with ammonia solution (100 mL/10 L water).
5. Rinse the tank with clean water, and flush through the booms using at least 10% of the spray tank volume, and then drain the tank.

8. **Application Tips:** Do not apply to crops underseeded to legumes. Apply Frontline 2,4-D early post-emergence to the main flush of broadleaf weeds. Warm moist conditions that promote active weed growth, small weed size, competitive crop and good growing conditions after application optimize weed control. Weeds hardened off by cold weather or drought stress may not be adequately controlled or suppressed, and re-growth may occur. For best results, ensure adequate spray coverage of the target weeds. Only weeds that are emerged at time of application will be controlled. If the foliage of the weed is wet at the time of application, control may be reduced.

9. **How it Works:** Florasulam SC is taken up by leaves and stops growth of susceptible weeds rapidly via inhibition of the ALS enzyme. 2,4-D is a systemic, non-selective herbicide, which readily moves through the foliage and root system. It inhibits pigment, including chlorophyll, leading to plant death.

10. **Expected Results:** Florasulam A symptoms will initially appear in the upper regions of the plant. Newer leaves start to yellow and wilt, followed by a loss of green colour. Symptoms will spread to the rest of the plant with some weeds showing purpling or reddening. Under ideal conditions, complete control may occur within 7 - 10 days after application. Plants susceptible to 2,4-D will become malformed before they die.

11. **Effects of Rainfall:** Do not apply if rainfall is expected within 2 hours.

12. **Movement in Soil:** Florasulam SC is not persistent in soil. Field studies in a wide variety of soils have shown the half-life of Florasulam SC in soil to range from 2 - 18 days. Florasulam SC degradation is not affected by soil type or by soil pH, but is moisture and temperature dependent. Florasulam SC is somewhat soluble in water, but is generally not mobile in soil under typical prairie conditions. 2,4-D leaching does not pose a problem.

13. **Cropping Restrictions:**

Drift: Do not allow spray mist to drift since drift can cause damage to non-target crops and plants. Do not apply when winds are gusty or in excess of 15 km/h. When spraying, avoid combinations of pressure and nozzle type that will result in fine particles (mist), which are more likely to drift.

Succeeding crops: Fields treated with Frontline 2,4-D herbicide tank mix can be seeded the following year to barley, canola, peas, wheat or summerfallowed. Do not seed crops other than those listed above for one year after treatment.

Grazing restrictions: Do not graze treated areas within 7 days of application. Do not harvest for livestock feed until 30 days after treatment. Withdraw meat animals from treated fields at least 3 days before slaughter.

14. **Toxicity:** Florasulam SC has extremely low acute toxicity. Acute LD_{50} = >6,000 mg/kg. 2,4-D has moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 300 - 1,200 mg/kg. Some formulations may cause skin irritation. Some formulations are toxic to fish. May cause burns and can be absorbed through the skin.

15. **Precautions, First Aid:** Do not get in eyes, on skin or on clothing. Wear impervious gloves, coveralls and chemical workers' goggles during the mixing and handling of Frontline 2,4-D. Wash thoroughly after handling. Wash contaminated clothes before reuse. Destroy contaminated shoes and leather articles. **If swallowed**, seek medical attention.

16. **Storage:** Store away from food, feedstuff, fertilizer, seeds, insecticides and fungicides or other pesticides or herbicides. Store in dry, heated storage. If products are frozen, bring to room temperature and agitate before use. Soak up small amounts of spill with absorbent clays.

17. **Resistance Management:** Frontline 2,4-D is both a Group 2 and a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Frontline 2,4-D and other Group 2 and 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Fusion *(fenoxaprop-p-ethyl + fluazifop-p-butyl)*

Group 1

Manufacturer: Bayer CropScience

CAUTION POISON

1. **Formulations: Component #1** (fenoxaprop-p-ethyl), emulsifiable concentrate, 80.5, g/L, 3.7 L jug; **Component #2** (fluazifop-p-butyl), emulsifiable concentrate, 125 g/L, 6.5 L jug.
2. **Registered Mixes:**

   Canola and triazine tolerant canola: Lontrel (227 mL/ac), Muster (8 - 12 g/ac – no surfactant required (Argentine varieties only).

   Flax: Buctril M (400 mL/ac), MCPA Ester or Amine 500 (340 mL/ac).
3. **Crops:** Canola (triazine tolerant canola), flax (including low linolenic acid varieties), field peas, lentils, mustard.
4. **Weeds Controlled:** Barnyard grass, green foxtail, Persian darnel, volunteer barley, volunteer wheat, wild oats.
5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Do not apply after the 5 leaf stage of canola. Do not apply later than the 6th node stage of lentils.

   Weed stage: Apply to young emerged, actively growing weeds. Weeds that emerge after application will not be controlled.

   Annual grassy weeds: 1 - 6 leaf stage.
7. **How to Apply:**

   With: Ground equipment. Do not apply by air.

   Rate: Component #1 at 185 mL/ac and **Component #2** at 325 mL/ac.

   Caution: Both components of the Fusion tank mix must be applied at the recommended rate or a reduction in grassy weed control may result.

   Water volume: 22.5 - 45 L/ac.

   Pressure: 275 kPa or 310 kPa if using check valves.

   Nozzles: The use of 80° or 110° flat fan nozzles is recommended for optimal spray coverage.

   Mixing instructions:

   1. Ensure the spray tank is thoroughly clean.
   2. Fill the tank half full with clean water and start agitation or bypass system.
   3. If a broadleaf herbicide is to be used with Fusion tank mix, add it first and agitate.
   4. Slowly add the correct amount of **Component #1** to the spray tank. Agitate thoroughly until **Component #1** is mixed completely.
   5. Add the correct amount of **Component #2** and continue agitation.
   6. Triple rinse the emptied containers into the spray tank.
   7. Add the remaining amount of water while agitation continues. Spray out immediately. Spray mixture should not be left in tank overnight.
   8. Thoroughly clean the spray tank after using Fusion tank mix and before using any other pesticide.

8. **Application Tips:** A time interval of 4 days prior to application or 4 days after application of Fusion tank mix is required before any other pesticide can be applied, unless registered as a tank mix. During periods of stress, plants are not actively growing. When daytime temperatures before and after application are very hot, combined with very dry conditions and low humidity, plants are under stress. Application of Fusion during these periods may result in substantially reduced control. Application of the spray at a forward angle of 45° will result in better penetration of the canopy and better coverage. Do not apply to crop stressed by severe weather conditions, frost, low fertility, drought, water saturated soil, disease or insect damage as crop injury may result.

9. **How it Works:** Contact as well as systemic, no soil activity. Regions of high meristematic activity such as root and shoot tips are known to be affected.

10. **Expected Results:**

    Grassy weeds: Reduction of leaf growth and chlorotic blotching within 1 - 3 days after application. Initial development of leaf chlorosis within 5 - 8 days after application and death within 14 - 21 days after application.

11. **Effects of Rainfall:** No effect 2 hours after application.

12. **Movement in Soil:** No soil movement. This product will not leach into the soil.

13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze treated fields prior to harvest. Pre-harvest interval: Canola: 80 days, Flax: 80 days, Lentils: 82 days, Field peas: 75 days, Mustard: 70 days.

14. **Toxicity:**

    Component #1 (fenoxaprop-p-ethyl): Acute oral LD_{50} (rats) = 3,355 mg/kg. May cause eye irritation and severe irritation of the skin.

    Component #2 (fluazifop-p-butyl): Acute oral LD_{50} (rats) = 2,451 mg/kg.

    Warning: Experimental feeding studies in rats have demonstrated that the active ingredient in **Component #2** can produce birth defects and other adverse effects in the developing fetus of rats. Women capable of bearing children should be particularly careful when handling this product. Occupational exposure to this product will be reduced by strict adherence to the handling precautions. Use directions provided.

15. **Precautions, First Aid:** Causes eye and skin irritation. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If inhaled**, remove patient from site of exposure. **If swallowed**, seek medical attention. If the tank mix spray solution, **Component #1** or **Component #2** are swallowed, do not induce vomiting but rush patient to nearest hospital taking label "Directions for Use" or the labelled container with you.

16. **Storage:** Keep away from fire, open flame or other heat sources. Do not store below freezing. If stored for 1 year or longer, shake well before using. Keep in original container during storage.

17. **Resistance Management:** Fusion is a Group 1 herbicide. Any weed population may contain or develop plants naturally resistant to Fusion and other Group 1 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Glyfos/Maverick/Renegade/Credit/Factor *(glyphosate)*

Group 9

Manufacturer: **Cheminova/Dow AgroSciences/Nufarm Canada/Interprovincial Co-operatives**

CAUTION IRRITANT

1. Formulations:

Glyfos: 360 g/L acid equivalent present as isopropylamine salt, 10 L, 115 L, 450 L, 1,000 L containers.

Maverick: 356 g/L acid equivalent present as isopropylamine salt, 10 L, 115 L, 450 L containers.

Renegade, Credit: 356 g/L acid equivalent present as isopropylamine salt, 10 L, 115 L, 750 L containers.

Factor: 356 g/L acid equivalent present as isopropylamine salt, 10 L, 115 L.

2. Registered Mixes:

Minimum tillage systems: Pardner + non-ionic surfactant, only for applications prior to planting barley, oats, wheat.

Chemical fallow use only: 2,4-D Amine (or Banvel or Pardner) + non-ionic surfactant.

Non-ionic surfactants: Ag-Surf, Agral 90, Companion, LI 700. Mixing with other pesticides: Not recommended.

3. Crops:

Prior to planting (all crops): Barley, canola, fall stubble treatment, flax (preharvest, including linola), lentils, non-crop areas, minimum or zero till cropping systems, pasture renovation, peas, soybeans, spot treatment (in-crop), summerfallow, wheat.

4. Weeds Controlled:

Annuals

annual bluegrass (9.0)
annual sow-thistle
barnyard grass
Canada fleabane
chickweed
common ragweed
corn spurry
crabgrass
dodder
downy brome
flixweed
green foxtail (7.9)
green smartweed
hemp-nettle
kochia
lady's-thumb
lamb's-quarters
narrow-leaved hawk's-beard
narrow-leaved vetch
night flowering catchfly
Persian darnel
prickly lettuce
redroot pigweed
round-leaved mallow
Russian thistle
shepherd's-purse
smooth pigweed
stinkweed
stork's-bill
volunteer barley
volunteer canola
volunteer corn
volunteer flax
volunteer mustard
volunteer wheat
wild mustard
wild oats
wild tomato

Perennials

alfalfa
Canada bluegrass (9.0)
Canada thistle (7.8)
cattail
common milkweed
cottontop
curled dock
field bindweed (7.2)
foxtail barley
hemp dogbane
hoary cress
Japanese knotweed
Kentucky bluegrass (9.0)
perennial sow-thistle
poison ivy
purple loosestrife
quackgrass
smooth bromegrass
toadflax
wormwood
yellow nutsedge

Brush

alder
birch
cedar
cherry
Douglas fir
hemlock
maple
pine
poplar
raspberry
rhododendron
sheep laurel
snowberry
willow
withrod

5. Weeds Suppressed:

Some weeds suppressed at lower rates.

6. When Used:

Annual weeds: Grassy and broadleaf weeds that are actively growing (see annual weed control chart for details). Dodder: spot treatment in sugar beets.

Perennial weeds:

Canada thistle (bud stage): At or beyond bud stage of growth.

Canada thistle (fall rosette): 15 cm in diameter and at least 5 weeks of growth. Majority of plants in a rosette stage.

Dandelion: Prior to seeding and post harvest.

Field bindweed: At or beyond full bloom and actively growing.

Milkweed: Bud to full bloom stage of growth.

Note: Reduced results may occur on plants treated after full bloom.

Quackgrass (spring, summerfallow, fall stubble): At least 20 cm high (3 - 4 leaf stage of growth) and actively growing.

Quackgrass (fall-tilled ground): Delay application in the spring until majority of quackgrass has 4 - 5 leaves. This stage usually occurs 1 - 4 weeks later on fall tilled ground than on undisturbed ground.

Other perennials: Mostly in head and early bud stage.

Brush: Actively growing brush from June through August.

7. How to Apply: **Do not use galvanized steel or unlined steel tanks, as a combustible gas may be formed.**

With: Ground equipment only: boom equipment, handgun, high volume equipment, wipers.

Rate:

Annual Weed Control

Rate (per ac)	Growth stage	Weeds controlled	Comments (apply in 20 - 40 L/ac water)
305 mL	Weeds up to 8 cm in height	Green foxtail, lady's-thumb, stinkweed, volunteer barley, volunteer canola, volunteer wheat, wild mustard, wild oats.	For wild oats, apply at 1 - 3 leaf stage. Add 150 mL of a surfactant registered for use such as Agral 90, Ag-Surf and Companion. For heavy wild oat infestations, use 405 mL/ac rate.
405 mL	Weeds 8 cm to 15 cm in height	For annual grasses listed above plus foxtail barley** (suppression only). All other broadleaf weeds listed above plus flixweed** and kochia**.	Add 145 mL of surfactant registered for use as listed above. Apply before initiation or senescence. ** Suppression only.
505 - 770 mL	Weeds up to 15 cm in height	All annual grasses listed above plus downy brome, giant foxtail, Persian darnel. All annual broadleaf weeds listed above plus Canada fleabane, common ragweed*, flixweed, hemp-nettle, lamb's-quarters, narrow-leaved hawk's-beard***, redroot pigweed, Russian thistle, volunteer flax, wild buckwheat**.	No additional surfactant is required. * Do not use these rates on plants greater than 8 cm in height. ** For 3 - 4 leaf stage, use 770 mL/ac rate. *** For weeds 8 - 15 cm in height, use 770 mL/ac rate.

(continued)

Glyfos/Maverick/Renegade/Credit/Factor (cont'd)

Annual Weed Control *(continued)*

Rate (per ac)	Growth stage	Weeds controlled	Comments (apply in 20 - 40 L/ac water)
910 mL	Weeds up to 15 cm in height	All annual grasses listed above, plus annual blue grass, crab grass. All broadleaf weeds listed above plus annual sow-thistle, kochia, narrow-leaved vetch, prickly lettuce, shepherd's-purse.	For additional broadleaf weed control option, refer to tank mix table.
1.4 L	Weeds over 15 cm in height	All annual grasses and broadleaf weeds listed above.	For additional broadleaf weed control option, refer to tank mix table.

Perennial Weed Control

Weed	Growth stage	Application Rate (L/ac)	Water volume (L/ac)	Comments
Canada thistle	Rosette stage (summer fallow)	1	20 - 40	Allow 10 or more days after treatment before tillage.
	Bud stage or beyond	1.9 - 2.8	40 - 120	Allow 5 or more days after treatment before tillage.
Common milkweed	Bud to full bloom	4.9	40 - 120	Allow 7 or more days after treatment before tillage. Reduced control may occur after full bloom. Milkweed may not be present in a correct stage, therefore, repeat treatment may be required.
Field bindweed	Full bloom or beyond	2.8 - 4.8	40 - 120	Allow 7 or more days after treatment before tillage.
Foxtail barley	Seedling to heading	1 - 2	20 - 40	Allow a minimum of 1 day after treatment before tillage or seeding. Use higher rate for larger, more established plants, heavy infestations or if plants are stressed.
Quackgrass (control, light to moderate infestations)	3 - 4 green leaves or more	1	20 - 120	Allow 3 or more days after treatment before tillage. For higher water volumes (i.e. 60 - 120 L/ac), an approved surfactant must be added at 0.5 litres per 100 litres of clean water (0.5% v/v).

(continued)

Perennial Weed Control *(continued)*

Weed	Growth stage	Application		Comments
		Rate (L/ac)	Water volume (L/ac)	
Quackgrass (long-term control, heavy infestations, high water volumes)	3 - 4 green leaves or more	1 - 2.8	20 - 120	Allow 3 or more days after treatment before tillage. Rates higher than 1 L/ac will provide more consistent long-term control, especially with heavier infestations and/or higher water volumes (i.e. 60 - 120 L/ac).
Toadflax	Vegetative stage (summer fallow)	1	20 - 40	Allow 7 or more days after treatment before tillage.

Annual Weed Control with Glyphosate Tank Mixtures (summer fallow and minimum tillage systems)

Tank mixtures	Rate (mL/ac)	Weeds controlled	Comments (apply in 20 - 40 L/ac water and add 145 mL/ac of surfactant)
Glyfos, Maverick, Renegade, Credit, Factor + Banvel	300 + 120	Cow cockle, flixweed*, green foxtail, kochia, lady's-thumb, lamb's-quarters, redroot pigweed**, Russian thistle, stinkweed, volunteer canola (rapeseed), volunteer cereals, wild buckwheat**, wild mustard, wild oats.	This tank mixture is registered for **summer-fallow use only**. Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm tall. * Glyfos, Renegade, Factor is applied at 405 mL/ac. ** Suppression only. See other tank mixtures for control option.
Glyfos, Maverick, Renegade, Credit, Factor + Pardner	300 - 400 + 500	Green foxtail, kochia**, lady's-thumb, redroot pigweed**, stinkweed, volunteer canola (rapeseed), volunteer cereals, wild buckwheat*, wild mustard, wild oats*.	This tank mixture is registered for **summer-fallow use only** and prior to wheat, oats and barley in minimum tillage systems. Weeds should be at least 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height. * Use Glyfos, Renegade, Factor at 400 mL/ac rate only for wild buckwheat control. ** 400 mL suppression only. See other tank mixtures for control option.
Glyfos, Maverick, Renegade, Credit, Factor + 2,4-D Amine or LV Ester (adjust rate if different formulation is used)	300 - 400 + 485	Flixweed, green foxtail*, kochia, lady's-thumb, lamb's-quarters, redroot pigweed, Russian thistle, stinkweed, volunteer canola (rapeseed), volunteer cereals, wild mustard, wild oats*.	This tank mixture is registered for **summer-fallow use only**. Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height. * Use Glyfos, Renegade, Factor at 400 mL/ac for wild oats and green foxtail control. ** Suppression only. See other tank mixtures for control option.

Glyfos/Maverick/Renegade/Credit/Factor (cont'd)

Annual Weed Control with Glyphosate Tank Mixtures (summer fallow and minimum tillage systems)

Rate (L/ac)	**Weeds controlled**	**Comments (apply in 50 - 100 L/ac water)**
0.5 - 0.77 Glyfos, Maverick, Renegade, Credit, Factor + 0.2 - 0.28[1] MCPA[†]	Canada fleabane, common ragweed*, downy brome, flixweed, gaint foxtail, green foxtail, hemp-nettle, kochia, lady's-thumb, lamb's-quarters, narrow-leaved hawk's-beard***, Persian darnel, redroot pigweed, Russian thistle, stinkweed, volunteer canola (rapeseed) (non-Roundup Ready), volunteer flax, volunteer cereals, wild buckwheat**, wild mustard, wild mustard.	**Use this tank mix prior to seeding in wheat, barley, rye, oats, corn (field & sweet), flax, and field peas.** No surfactant required. * **Do not** use these rates on plants greater than 8 cm in height. ** For 3 - 4 leaf stage, use 0.77 L/ac rate. *** For weeds 8 cm to 15 cm in height, use 1.9 L/ac rate. [1] MCPA amine at 0.2 - 0.28 L/ac (101 - 141 g ai/ac) **prior to peas.**
0.5 - 0.77 Glyfos, Maverick, Renegade, Credit, Factor + 0.2 - 0.4[2] MCPA[†]	Bluebur[3], burdock (before 4 leaf stage), false flax[3], flixweed, lamb's-quarters[3], mustard[3] (except dog & tansy), prickly lettuce[3], ragweed[3], redroot pigweed[3], Russian pigweed[3], shepherd's-purse[3], stinkweed[3], vetch[3], wild radish[3], wild sunflower[3].	[2] MCPA at 0.2 - 0.4 L/ac (101 - 202 g ai/ac) **prior to wheat, barley, oats, corn (field & sweet), rye and flax.** [3] MCPA at 0.28 - 0.4 L/ac (141 - 202 g ai/ac) only.
[†] 500 g/L formulation, if another formulation is used, adjust rate accordingly		
0.5 - 0.77 Glyfos, Maverick, Renegade, Credit, Factor + 0.2 - 0.4[1] Buctril M	Canada fleabane, common ragweed*, downy brome, flixweed, giant foxtail, green foxtail, hemp-nettle, kochia, lady's-thumb, lamb's-quarters, narrow-leaved hawk's-beard***, Persian darnel, redroot pigweed, Russian thistle, stinkweed, **volunteer canola (rapeseed) (non-Roundup Ready)**, volunteer cereals, volunteer flax, **volunteer Roundup Ready Canola (1 - 4 leaf stage)**[1,2], wild buckwheat**, wild mustard, wild oats. **Seedlings up to the 4 leaf stage**[2]: American nightshade, ball mustard, bluebur, cow cockle, flixweed, green smartweed, kochia[3], lady's-thumb, night-flowering catchfly, pale smartweed, redroot pigweed, Russian thistle[3], scentless chamomile[4], shepherd's-purse. **Seedlings up to 6 leaf stage:** Wild tomato. **Seedlings up to 8 leaf stage:** Common buckwheat, common groundsel, common ragweed, lamb's-quarters, stinkweed, tartary buckwheat, wild buckwheat, wild mustard, wormseed mustard. **Perennials (top growth)**[2]: Canada thistle, perennial sow-thistle.	**Use this tank mix prior to seeding in wheat, barley, rye, oats, corn, flax, canary seed and seedling grasses (for complete listing of grasses, refer to label).** No surfactant required. * **Do not** use these rates on plants greater than 8 cm in height. ** For 3 - 4 leaf stage use 0.77 L/ac rate. *** For weeds 8 cm to 15 cm in height use 0.77 L/ac rate. [1] Buctril M at 0.2 - 0.4 L/ac (113 - 226 g ai/ac) for all crops listed. [2] Buctril M at 0.4 L/ac (226 g ai/ac only). [3] Spray before plants are 5 cm high. [4] Spring annuals only. 5 Spray before plants are 8 cm high.

Preplant or preseed application in direct seeding systems (all crops): 500 - 750 mL/ac on annual weeds up to 15 cm in height. Apply prior to seeding or after seeding but before crop emergence for control of emerged weeds in direct seeding systems. Ensure weeds are at the desired stage at time of application. This product does not provide pre-emergent weed control, and newly germinating weeds may be a problem in the crop.

Water volume: Handgun, high volume (coarse sprays only): 80 - 120 L/ac. Boom: 40 - 120 L/ac. Chemical fallow, reduced rates: 20 - 40 L/ac. Always use clean water, free of sediments.

Pressure: 275 kPa.

Nozzles: Flat fan nozzles for volumes 20 - 40 L/ac: flood jet type or flat fan for volumes above 40 L/ac.

8. **Application Tips:** Tillage or mowing prior to application will reduce effectiveness on perennial weeds. Minimum (days) to wait before tillage after application: annual weeds (3); spring and fall quackgrass (3); Canada thistle bud stage (5), fall rosette stage (7 - 10); field bindweed, milkweed, other perennials (7). Before commencing tillage, allow at least 3 full days (72 hours) after application for quackgrass control and 5 - 7 days after application for thistles if applied other than at early bud stage.

Quackgrass control:

Spring and fall treatments in annual and forage cropping systems: Apply to actively growing quackgrass. Reduced control may result if rhizomes become dormant. This may occur when soil fertility is poor or land has not been tilled for several years.

Application on forages should be followed by tillage and should be made when good growing conditions exist.

Fall treatments should be applied 3 - 4 weeks after swathing to actively growing quackgrass.Quackgrass can be treated after mild frost provided there are 3 - 4 green leaves actively growing at the time of application. Do not apply after first damaging frost in the fall. Frost of -5°C is usually tolerated by new shoots. Frost damage is evident by the drying of new shoots shortly after frost.

Allow 3 or more days after application before tillage.

For best results on fall till ground, delay application in the spring until majority of quackgrass has 4 - 5 leaves. This stage usually occurs 1 - 4 weeks later on fall tilled ground than on undisturbed ground.

Canada thistle (fall rosette): Conduct summerfallow tillage as usual and perform last tillage operation between July 15 and August 1. Allow thistles to regrow for a minimum of 5 weeks until they are 15 cm in diameter and majority of them are in a rosette stage.

9. **How it Works:** A non-selective, systemic herbicide that moves from the foliage into the roots and kills the entire plant.

10. **Expected Results:** Wilting and yellowing of annuals occurs within 2 - 4 days; perennials require 7 - 10 days. Complete browning of above ground growth and deterioration of roots occurs. Cool or cloudy weather may slow activity.

11. **Effects of Rainfall:** Heavy rainfall immediately after application may wash the chemical off the foliage, and a repeat treatment may be required. Do not apply if rainfall is forecast for the time of application.

12. **Movement in Soil:** The amount of glyphosate leaching is very low.

13. **Cropping Restrictions:**

Grazing restrictions: Do not graze or harvest treated areas until plants have turned brown and started to deteriorate.

14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 4,320 mg/kg. Eye irritant. Non-toxic to bees, birds and fish.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

Glyfos/Maverick/Renegade/Credit/Factor (cont'd)

16. **Storage:** Heated storage not required.
17. **Resistance Management:** Glyfos/Maverick/Renegade/Credit/Factor is a Group 9 herbicide. Any weed population may contain or develop plants naturally resistant to Glyfos/Maverick/Renegade/Credit/Factor and other Group 9 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Roundup Ready Canola (Glyfos and Factor only)

Crop: Canola with Roundup Ready Gene. Note: Always use pedigreed (i.e. certified) canola seed. Canola, which is not designated as glyphosate tolerant, will be damaged or destroyed by this treatment.

Weed controlled, growth stage and rate:

Product rate	Weeds controlled
0.33 - 0.50 L/ac	**Annual weeds:** Barnyard grass, chickweed, cleavers, corn spurry, cow cockle, flixweed, green foxtail, hemp-nettle, kochia, lady's-thumb, lamb's-quarter, narrow-leaved hawk's-beard, night-flowering catchfly, redroot pigweed, round-leaved mallow, Russian thistle, shepherd's-purse, smartweed, stinkweed, stork's-bill, volunteer barley, volunteer canola (except Roundup Ready varieties), volunteer wheat, wild buckwheat, wild mustard, wild oats, wild tomato.
0.5 L/ac	Cleavers, cow cockle, flixweed, narrow-leaved hawk's-beard, night-flowering catchfly, shepherd's-purse, smartweed, stork's-bill, wild buckwheat. **Perennial weed suppression:** Canada thistle, dandelions, perennial sow-thistle, quackgrass (season-long control).
Repeat application at 0.5 L/ac	**Perennial weed season-long:** Foxtail barley, round-leaved mallow.
0.75 L/ac	**Perennials (season-long control):** Canada thistle, perennial sow-thistle.

Roundup Ready Corn (Glyfos and Factor only)

Crop: Corn with the Roundup Ready gene. **Note** – Always use glyphosate tolerant pedigreed (i.e. certified) corn seed. Corn that is not designated as glyphosate tolerant will be damaged or destroyed by this treatment.

Weed controlled, growth stage and rates:

Product rate	Weeds controlled
1.0 L/ac	**Annual weeds:** Barnyard grass, green foxtail, volunteer barley, volunteer wheat, wild oats. **Annual broadleaf:** Chickweed, cleavers, corn spurry, cow cockle, flixweed, hemp-nettle, kochia, lady's-thumb, lamb's-quarter, narrow-leaved hawk's-beard, night-flowering catchfly, redroot pigweed, round-leaved mallow*, Russian thistle, shepherd's-purse, smartweed, stinkweed, stork's-bill, volunteer canola (except Roundup Ready varieties), wild buckwheat, wild mustard, wild tomato **Perennials:** Canada thistle**, dandelion, perennial sow-thistle**, quackgrass

* For control of round-leaved mallow, use two applications of 1.0 L/ac.

** A second (sequential) application of 1.0 L/ac will improve control in heavy weed infestations.

Application tips: A second application may be used for late emerging weed flushes after initial application. This second application must be made no later than the 8 leaf stage of the corn. Weeds will be more easily controlled, and early crop competition may be avoided with applications made when weeds are small. Control of weeds greater than 25 cm in height will be inconsistent, although some weeds may be controlled.

Rate: 1.0 L/ac. No additional surfactant is required.

With: Ground application only. **Do not apply by air.**

Water volume: 40 - 90 L/ac.

Crop stage: Up to and including 8 leaf stage.

Grazing and cropping restrictions: All portions of the treated crop may be fed to livestock.

Preharvest: Glyfos/Maverick/Renegade/Credit/Factor

Application may be made prior to harvest for the control of quackgrass, Canada thistle, common milkweed, toadflax, dandelion, season-long control of perennial sow-thistle.

Crop: Wheat, barley (including malting barley), canola (rapeseed), dry beans, flax, lentils, peas and soyabean.

Rate: 1 L/ac. Do not apply to crop grown for seed.

With: Ground equipment. **Do not apply by air.**

Crop timing: Apply when average seed moisture content is at or below 30%. Accurate measurement of seed moisture content must be made before application. This stage typically occurs 7 - 14 days before harvest. For forage crops, apply at 1 - 2 L/ac 3 - 7 days prior to the last cut before rotation or forage renovation. Consult the table below for visual indicator of this stage in each crop.

Guidelines for Timing of Pre-harvest Applications

Crops	Per cent seed moisture	Visual symptoms
Barley, wheat	Less than 30	Hard dough stage, a thumb impression remains on the seed
Canola	Less than 30	Pods are yellow to green and most seeds are yellow to brown
Dry beans	Less than 30	Stems are green to brown; pods are mature (yellow to brown); 80 - 90% leaf drop (original leaves)
Flax (including linola)	Less than 30	Majority (75 - 80%) of pods are brown
Forages	Not applicable	Normal stage for forage harvesting
Lentils	Less than 30	Lowermost pods (bottom 15%) are brown and seeds rattle
Peas	Less than 30	Majority 75% - 80% of pods are brown
Soybean	Less than 30	Stems are green to brown; pod tissue is brown and dry in appearance (80 - 90% leaf drop)

Weeds controlled: Quackgrass, Canada thistle, common milkweed, toadflax, dandelion, perennial sow-thistle (season-long) and most of the annual weeds.

Weed stage: For best weed control results, apply when quackgrass is actively growing and at least 4 - 5 green leaves. Canada thistle and perennial sow-thistle should be actively growing and at or beyond the bud stage for best results.

Application tip: This treatment may also provide harvest management benefits by drying down crop and vegetative crop growth and late tillering that may interfere with harvest operations. Apply only during the period 7 - 14 days (or 3 - 7 days for forage applications) before harvest to ensure best weed control and to maximize harvest-aid benefits. Earlier application may reduce crop yield and/or quality and may lead to excess glyphosate residues in the crop. Extremely cool, wet and/or cloudy weather between time of application and the anticipated harvest date may slow down activity of this product, thereby delaying crop dry down and harvest date.

Caution: Do not apply to any crops if **grown for seed**.

Consult malt buyers before using **preharvest on malt barley**. All portions of the treated crops may be fed to livestock.

Gramoxone *(paraquat)*

Group 22

DANGER POISON

Manufacturer: **Syngenta Crop Protection Canada Inc.**

1. **Formulations:** Solution; 200 g/L; 1, 4 x 5 L pack.
2. **Registered Mixes:** Lexone, Lorox, Patoran, Sencor and 2,4-D.

   Chemical mowing of non-crop areas: May be tank mixed with certain soil sterilants where immediate top kill and long-term sterilization are required.
3. **Crops:** Asparagus, non-crop areas, potatoes, shelterbelts, stale seedbed (field crops, vegetables), sugar beets.
4. **Weeds Controlled:** All top growth. Generally kills annuals in 1 application. Repeat applications may be needed on perennials.
5. **Weeds Suppressed:** Most perennial weeds.
6. **When Used:**

   Crop stage: Prior to crop emergence but soon after weeds emerge.

   Potatoes: Apply up to ground crack (potatoe tops about to emerge) only for Netted Gem and Cherokee. Other varieties apply up until the first potato tops are 5 - 8 cm. Do not apply to emerged potato foliage in the evening, or to early potatoes when potatoes are under moisture stress due to extremely dry soil conditions.

   Stale seedbed: Apply up to 3 days before crop emergence and no later.
7. **How to Apply:**

   With: Ground equipment only. Do not use mist blowers.

   Rate:

   Chemical mowing: 1.1 L in 220 - 445 L/ac of water.

   Non-crop areas: 2.2 - 4.5 L in 220 - 445 L/ac of water.

   Potatoes: Quackgrass, annual grasses and broadleaf weeds: 1 - 1.75 L in 120 - 220 L/ac of water; emerged seedlings thereof: only 610 mL in 120 - 220 L/ac of water. **Note:** Application to exposed or emerged potato foliage will cause temporary injury and chlorosis. Use of poor or diseased seed and cut seed with 1 eye will make potatoes more susceptible to injury by post-emergence sprays. Will not control weeds that germinate after treatment.

   Shelterbelts: 2.2 L in 445 L of water/ac or 75 mL in 10 L of water/100 m^2. 550 mL of this mixture will treat an area 1.75 min diameter around a tree. Keep chemical off the tree foliage.

   Stale seedbed technique (vegetables, field crops): Beans (all types), beets, carrots, cole crops, corn, cucumbers, onions, peas, potatoes, soybeans, turnips. Prepare a seedbed at least 2 - 4 weeks before seeding to stimulate weed growth. Seed with minimum soil disturbance. Burn-off of emerged weeds: 1.1 - 2.2 L in 120 - 445 L of water/ac before or after seeding. Weeds above 5 cm tall: 2.2 L/ac.

   Water volume: 120 - 445 L/ac. Thoroughly wet all foliage. For dense weed growth, use the greater volume of water.

   Pressure: 300 kPa.

   Nozzles: Flat fan recommended.

   Incorporation: Not applicable.
8. **Application Tips:** Use only clean water to avoid reduction in effectiveness. Use high volume, low pressure type spraying equipment to thoroughly cover foliage. Special equipment is necessary to shield some row crops from spray. Applications on cloudy days or just prior to or during periods of darkness will generally increase the treatment effectiveness. Wash equipment thoroughly after spraying – use a wetting agent (Agral 90 at 60 mL/100 L of water), flush and spray out, then thoroughly rinse with clean water. Fill with clean water and leave overnight, then spray out.

9. **How it Works:** Gramoxone is a contact type herbicide; therefore, good spray coverage is essential. It is absorbed by all leaf and stem surfaces and is non-systemic. It interferes with photosynthesis.
10. **Expected Results:** Provides immediate, fast and virtually complete annual weed kill from 1 application. Repeat applications may be necessary for perennial weeds. Yellowing occurs within a few hours and desiccation of the plant continues rapidly until death.
11. **Effects of Rainfall:** Rain prior to spray solution drying on plant or muddy water will reduce effectiveness of the chemical. Once spray solution has dried on plant tissue, rain will not reduce effectiveness.
12. **Movement in Soil:** Binds to the soil and becomes biologically unavailable. No residual effect.
13. **Cropping Restrictions:**

    Succeeding crops: No restriction.

    Drift: Prevent drift onto crops, ornamentals, lawns, grazing areas or other desirable areas.

    Grazing restrictions: Not applicable.

    Crop use after hail: No restriction.
14. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = paraquat ion 120 - 150 mg/kg. Symptoms of acute poisoning may occur. Intake can cause heart, liver and kidney damage and can be fatal. It can be absorbed through the skin.
15. **Precautions, First Aid: Keep out of reach of children and animals.** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Heated storage preferred. Will crystallize if frozen. Never transfer to other containers.
17. **Resistance Management:** Gramoxone is a Group 22 herbicide. Any weed population may contain or develop plants naturally resistant to Gramoxone and other Group 22 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Gramoxone PDQ *(paraquat + diquat)*

Group 22

Manufacturer: Syngenta Crop Protection Canada Inc.

WARNING POISON

1. **Formulations:** Liquid; paraquat 132 g/L + diquat 66 g/L; 10 L.
2. **Registered Mixes:** None.
3. **Crops:** Barley, canaryseed, canola, corn, dry common beans, field peas, flax (including low linolenic acid varieties), lentils, mustard, oats, potatoes, rye, soybeans, sunflowers, triticale, wheat.
4. **Weeds Controlled:** Annual grass and broadleaf weed seedlings.
5. **Weeds Suppressed:** Perennial grass and broadleaf weeds, winter annual weeds.
6. **When Used:** Apply before seeding or after seeding, but prior to crop emergence, to control emerged weeds in conventional and minimum tillage production systems and when using stale seedbed production techniques.

Gramoxone PDQ (cont'd)

7. **How to Apply:**

   With: Ground equipment only. Do not apply through mist blowers. Do not apply by aircraft.

   Rate:

   For control of annual grass and broadleaf weed seedlings: 0.8 - 1.6 L/ac.

   Minimum 1.2 L/ac for control of winter annual weeds or when weed growth is dense and weeds are greater than 10 cm in height. (also increase volume of water).

   Water volume: Apply in at least 40 L/ac. Thoroughly wet all foliage. For dense weed growth, use higher volume of water.

8. **Application Tips:** Use clean water for spraying. Muddy water will reduce effectiveness. Dust disturbed by equipment tires or on plant leaves will reduce effectiveness. Applications made on cloudy days, during dull sunlight or just prior to or during periods of darkness will generally increase effectiveness. Avoid application or drift onto crops, ornamental plants, lawns, grazing areas or other desirable growth. Not to be used as a desiccant.

9. **How it Works:** Gramoxone PDQ is a contact type herbicide; therefore, thorough spray coverage is essential. Absorbed by all leaf and stem surfaces, non systemic. Interferes with photosynthesis.

10. **Expected Results:** Fast and complete top kill of all annual weeds. Yellowing starts within a few hours of applications. No systemic activity therefore will only control the top growth of perennial plants.

11. **Effects of Rainfall:** Rain falling shortly after application normally will not reduce the effectiveness of the treatment.

12. **Movement in Soil:** Inactivated on contact with the soil, therefore has no residual effect.

13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze or harvest crops within 30 days of treatment.

14. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = 661 mg/kg.

15. **Precautions, First Aid:** Wear long-sleeve chemical resistant gloves, goggles or a face shield, a long-sleeve shirt and long pants and chemical resistant apron when handling the concentrate. Avoid contact with spray solution. Do not re-enter treated areas within 24 hours.

    If in eyes, flush with clean water for 15 minutes and get medical attention even if no irritation arises. Call a physician or contact a Poison Control Centre. **If on skin**, wash thoroughly with water. Remove contaminated clothing immediately. Wash separately from household laundry before reuse. **If irritation develops**, contact a physician or contact a Poison Control Centre. **If swallowed**, induce vomiting if not already occurring. **Get to nearest hospital fast. This is essential.** If delay unavoidable, administer fluids and induce further vomiting. Contact a Poison Control Centre.

16. **Storage:** Do not freeze. If crystallization occurs because of storage below 0°C, warm to room temperature and agitate until reconstituted.

17. **Resistance Management:** Gramoxone PDQ is a Group 22 herbicide. Any weed population may contain or develop plants naturally resistant to Gramoxone PDQ and other Group 22 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Grazon *(picloram + 2,4-D)*

Group 4

Manufacturer: **DowAgroSciences Canada Inc.**

1. **Formulation:** Emulsifiable concentrate; 65 g picloram + 240g 2,4-D Amine/L; 10 L jug.
2. **Registered Mixes:** None.
3. **Crops:** Permanent grass pastures and rangeland.
4. **Weeds Controlled:** 1.5 L/ac: Canada thistle, common yarrow, dandelion. 2.8 L/ac: Burdock, Canada thistle, common ragweed, common yarrow, fleabane, goldenrod, plantain, prickly lettuce, red clover, sweet clover, vetch, wild carrot.
5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Apply in spring or early summer.

   Weed stage: After weeds have fully emerged and when weeds are growing rapidly.
7. **How to Apply:**

   With: Ground equipment or by air using a drift control system or agent.

   Rate: 1.5 - 2.8 L/ac.

   Water volume: 60 - 80 L/ac.

   Nozzles: Apply with nozzles that produce coarse uniform droplets.

   Pressure: Use pressures within nozzle manufactures recommended range.
8. **Application Tips:** Apply in spring or early summer after weeds have fully emerged and when weeds are growing rapidly. Ensure that there is adequate coverage of target weeds. Broadleaf crops are extremely sensitive to Grazon, and care should be taken to prevent drift onto sensitive crops. Do not contaminate water used for irrigation or domestic purposes. Do not apply on soils that are very permeable (sandy loam to sand) through the entire profile and that have an underlying shallow aquifer.
9. **How it Works:** Interferes with cell division, causing leaf cupping, stem distortion and eventual death of plant. Grazon is absorbed through leaves and roots.
10. **Expected Results:** Perennial weeds show distorted stems and cupped leaves, which turn yellow and then brown. Usually native grass increases in abundance as a result of reduced competition. Poor results may be expected if weeds are not actively growing in late summer or due to drought or frost.
11. **Effects of Rainfall:** Heavy rainfall immediately after application may wash the chemical off the foliage, resulting in reduced weed control. Do not apply if rainfall is forecast for the time of application.
12. **Movement in Soil:** Picloram, one of the components of Grazon, is very soluble in water and moves with water in coarsely textured soils.
13. **Cropping Restrictions:** Legumes may not be established in a pasture for several years after a Grazon treatment. If legumes are essential in a pasture, do not use Grazon. Do not break up treated pasture and plant to sensitive broadleaf crops for at least 5 years after application of Grazon. Do not graze lactating dairy animals in treated area within 7 days after treatment. Withdraw meat animals from treated fields 3 days prior to slaughter. Do not harvest forage or cut hay within 30 days after application. Do not move cut forage or manure from treated areas to areas that may be seeded to a sensitive corp.
14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = 2,598 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

Grazon (cont'd)

If in eyes, flush with flowing water immediately and continuously for 15 minutes. Get medical attention or contact a Poison Control Centre. **If on skin**, wash off with plenty of soap and water. Get medical attention or contact a Poison Control Centre if irritation persists. **If swallowed**, call a physician or contact a Poison Control Centre. Take container, label or product name and Pest Control Product Registration number with you and seek medical attention. Do not induce vomiting unless instructed by qualified medical personnel.

16. **Storage:** Store in a cool, dry place. Do not freeze. If freezing occurs, bring to room temperature and mix thoroughly.
17. **Resistance Management:** Grazon is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Grazon and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Harmony Total *(clodinafop-propargyl + thifensulfuron methyl + tribenuron methyl)*

Group 1,2

Manufacturer: DuPont Canada Inc.

WARNING POISON

1. **Formulations:**
   1. Refine Extra (Dry flowable): 50% thifensulfuron methyl, 25% tribenuron methyl; Toss-N-Go 320 grams, (4 x 80 grams) water soluble pouches.
   2. Horizon emulsifiable concentrate: 240 g/L; 1 x 3.7 L + 2 x 6.4 L Score.
2. **Registered Mixes:** MCPA Ester (250 - 340 mL/ac).
3. **Crops:** All types of durum wheat and spring wheat.
4. **Weeds Controlled:**

chickweed (8.5)
common groundsel
corn spurry (8.8)
cow cockle (8.7)
green foxtail
green smartweed
hemp-nettle (8.4)
kochia (7.8)
lady's-thumb
lamb's-quarters (8.6)
narrow-leaved hawk's-beard
redroot pigweed (8.4)
Russian thistle (7.9)
shepherd's-purse (8.2)
stinkweed (8.6)
tartary buckwheat (8.3)
volunteer rapeseed (8.6) (excluding CLEARFIELD)
wild buckwheat (7.7)
wild mustard (8.6)
wild oats

5. **Weeds Suppressed:** Canada thistle (7.1), cleavers (6.7), round-leaved mallow (6.4), scentless chamomile (6.9), sow-thistle, stork'-bill (6.7), toadflax (less then 15 cm tall)(7,1).
6. **When Used:**

Crop stage: Apply post-emergence to crop from 2 leaf to before emergence of the 4th tiller.

Weed stage: Green foxtail: 1 - 5 true leaves on the main stem, prior to emergence of 3rd tiller, while actively growing. **Wild oats:** 1 - 6 true leaves on the main stem and prior to emergence of the 4th tiller.

Broadleaf weeds: Apply to young, actively growing broadleaf weeds before the canopy closes. Weeds emerging after treatment may not be controlled. Annual smart weed, green smart weed, lady's thumb, ball mustard, corn spurry, cow cockle, flix weed, hemp-nettle, common groundsel, kochia, lamb's quarters, narrow-leaved hawk's beard, redroot pigweed, Russian thistle, shepherd's purse, stinkweed, tartary buckwheat, volunteer canola, wild mustard: less than 10 cm tall or across. **Chickweed:** 1 - 6 leaf stage. **Cleavers:** 1 - 3 whorl stage. **Wild buckwheat:** cotyledons to 3 leaf stage.

Canada thistle, sow-thistle: Apply when the majority of the thistles have emerged and are actively growing. For best top growth control, apply when thistles are larger than 15 cm tall before bud stage and before crop canopy prevents thorough coverage of the thistles. **Round-leaved mallow:** 2 - 6 leaf stage (10 - 12 cm in height). **Toadflax:** less than 15 cm in height. A control program for this weed includes both frequent tillage and chemical application.

7. **How to Apply:**

With: Ground equipment only. Do not apply by air.

Rate: Horizon: 95 mL/ac, Refine Extra: 8 g/ac, Score 0.8% v/v of spray solution.

Water volume: 40 L/ac.

Pressure: 275 kPa.

Nozzles: Use flat fan nozzles. Use 50 mesh screens or larger. Use only metal or nylon filters.

Mixing instructions:

1. To clean spray tank, fill 1/4 to 1/3 with clean water. Start agitation or bypass system.
2. Add Refine Extra first to the spray tank and agitate for 2 - 3 minutes.
3. Add required amount of Horizon.
4. Agitate for 2 - 3 minutes.
5. Add required amount of Score Adjuvant.
6. Agitate for 1 - 2 minutes before adding remainder of water.
7. After any break in spraying operations, agitate thoroughly before spraying again.
8. Use the spray suspension as soon it is prepared.
9. If an oil film starts to build-up in the tank, drain tank and then clean with a detergent.

Sprayer cleanup: To avoid injury to susceptible crops, thoroughly clean sprayer immediately after spraying. Ammonia must be used to deactivate Harmony Total when cleaning.

1. Drain and flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to ensure removal of all visible residues of Harmony Total. If necessary, repeat step 1.
2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum of 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, then add more water and ammonia to completely fill tank so that all surfaces are in contact with the solution. Allow to sit for 15 minutes with agitation. Again, flush the hoses, booms and nozzles with the cleaning solution and drain the tank.
3. Remove nozzles and screens, and clean separately in bucket containing cleaning agent and water.
4. Repeat step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips:** Higher spray volumes are required for dense crop canopy and/or large weeds. Weeds should be less than 10 cm tall or across at application. Effectiveness of Harmony Total may be reduced if it remains in the tank for more than 24 hours. Do not use flood type nozzles, controlled droplet application equipment, spray foils or hollow cone nozzles. Do not apply to crop stressed by conditions such as frost, low fertility, drought, flooding, disease or insect damage as crop injury may result.

9. **How it Works:** Harmony Total is absorbed by the foliage and rapidly translocated to the growing points. Inhibits cell elongation in broadleaf weeds. Thorough coverage of the plants is essential for consistent control.

10. **Expected Results:** Broadleaf weed growth stops immediately. Discolouration of dying weeds may be noticeable for 1 - 3 weeks after application, depending on growing conditions and weed species. Grassy weeds – depending on the species, growing conditions and crop competition – leaves and growing points turn yellow within 1 - 3 weeks after application. Further colour changes and loss of vigor will be observed followed by a browning, and complete control occurs 3 - 5 weeks after application. **Poor results may be expected if** there is improper mixing, timing or coverage, or when weeds are under drought stress.

Harmony Total (cont'd)

11. **Effects of Rainfall:** Rainfall within 4 hours of application may lessen degree of weed control.
12. **Movement in Soil:** Harmony Total moves little in the soil and disappears from the soil quickly.
13. **Cropping Restrictions:** Do not treat wheat underseeded to forages. Do not plant to any crop until 2 months after application. Do not exceed a total of 8 g/ac of Refine Extra per crop year.

    Grazing restrictions: Wheat may be grazed 7 days after the application of Harmony Total.

    Other restrictions: Pre-harvest interval is 60 days.
14. **Toxicity:** Acute oral LD_{50} (rats) = 2,276 mg/kg; Acute dermal LD_{50} (rats) = 4,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store product in closed, original container in a cool, dry, well ventilated room.
17. **Resistance Management:** Harmony Total is both a Group 1 and a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Harmony Total and other Group 1 and 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Heritage 5G/Advance 10G

(trifluralin)

Wheat – Brown Soil Zones Only

Group 3

Manufacturer: **Dow AgroSciences Canada Inc.**

1. **Formulations:** Heritage granular; 5%; 25 kg bag and 725 kg returnable bulk bag. Advance granular; 10%; 22.7 kg bag and 454 kg returnable bulk bag.
2. **Registered Mixes:** None.
3. **Crops:** Durum wheat, spring wheat (8.6).

    Underseeding: Not recommended.
4. **Weeds Controlled:**

    Fallow year

    barnyard grass (8.3)
    cow cockle (9.0)
    green foxtail (8.1)
    lamb's-quarters (8.0)
    Persian darnel
    redroot pigweed (8.2)
    Russian thistle (7.9)
    wild buckwheat (8.3)
    wild oats (7.5)

    Crop year: Green foxtail, lamb's-quarters.
5. **Weeds Suppressed:**

    Crop year: Wild buckwheat, wild oats.
6. **When Used:** Apply to summerfallow in May, June and July for weed control during both years of a summerfallow-wheat rotation. Maximum benefit comes when applied as early as possible in the fallow year. **Also see Special use** below under number 17.

7. **How to Apply:**

With: Ground equipment with granular applicator.

Rate:

		May	June	July
1 - 3% Organic matter	– Heritage	7.7 kg/ac	6.5 kg/ac	5.3 kg/ac
	– Advance 10G	3.8 kg/ac	3.2 kg/ac	2.6 kg/ac
4 - 8% Organic matter	– Heritage	8.9 kg/ac	7.7 kg/ac	6.5 kg/ac
	– Advance 10G	4.5 kg/ac	3.8 kg/ac	3.2 kg/ac

Brown soil zones only.

Incorporation: If green growth prevents proper mixing, it must be destroyed before application. Apply over standing or pre-worked stubble, provided straw is chopped and evenly distributed. Incorporate within 24 hours of application to 5 - 8 cm with cultivator (field or deep tillage) at 10 - 13 km/h or disc at 7 - 10 km/h. Second incorporation at the same depth and right angles to first. Repeat when necessary to control resistant weeds in fallow year. Cultivation with a rodweeder or shallow tillage cultivator may be required. Do not cultivate when soil is crusted, lumpy or too wet for good mixing action. Working deeper than 8 cm can result in erratic weed control and crop injury.

8. **Application Tips:** Do not apply on soils subject to prolonged flooding, sandy soils with less than 1% organic matter, soils with more than 8% organic matter or soils in poor working condition. Application to severly eroded knolls may result in reduced crop stands. In the fall, prior to application, spread straw evenly over field and leave stubble standing to trap snow. For maximum effectiveness, apply in May. After filling granular applicator, close lid quickly to avoid exposure to direct sunlight. In crop year, after application and when soil is warm enough for good germination, prepare seedbed with field cultivator set at 5 cm deep. Seed into a weed-free seedbed, 3 - 6 cm deep, using double disc or hoe drill. Separate spring tillage may not be necessary with a discer or airseeder. Pack or harrow after seeding. Drought conditions in fallow year, prior to seeding, may result in higher carry-over of Heritage at seeding time. To reduce possible injury by carry-over, seeding to the correct depth (3 - 6 cm) and into a warm, moist seedbed is critical. Use quality seed and agronomic practices that promote good, rapid, even crop germination and emergence for each crop seeded. Drought conditions in fallow year, prior to seeding, may result in higher carry-over of Heritage at seeding time.

9. **How it Works:** Seedlings are killed during germination by inhibited cell division at active growing points. This activity results in puffy, brittle, slow growing shoots and swollen brittle root tips. Established weeds are not controlled.

10. **Expected Results:**

Weeds: After first incorporation, susceptible weeds are partially controlled. After second operation, susceptible weeds are controlled before emergence.

Crop: No injury to wheat, after summerfallow. Over-application caused by overlapping, improper calibration, non-uniform application, etc. may reduce crop stand, delay development or reduce yields.

11. **Effects of Rainfall:** No effect once incorporated into the soil.

12. **Movement in Soil:** None.

13. **Cropping Restrictions:**

Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 10,000 mg/kg. Non-toxic to bees. Very toxic to fish. Large amounts of Heritage can be tolerated by fish in runoff or muddy water because it binds to suspended soil. Intake can cause heart, liver and kidney damage. A small amount of vomited liquid inhaled can be fatal.

Heritage 5G/Advance 10G (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in areas not exposed to high temperatures, prolonged direct sunlight or moisture.
17. **Resistance Management:** Heritage 5G/Advance 10G is a Group 3 herbicide. Any weed population may contain or develop plants naturally resistant to Heritage 5G/Advance 10G and other Group 3 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

    Special use: Durum wheat , spring wheat (including semi-dwarf) – **Fall application only. (September 1 to soil freeze-up)**.

    Weeds controlled: Green foxtail.

    Incorporation: (as above) First incorporation within 24 hours of application, 5 - 8 cm deep. Second incorporation at same depth and right angles to first, in the fall at least 3 days later or in the spring during seedbed preparation.

    Application tip: Do not apply Heritage on stubble in the fall if the crop harvested in the current calendar year was treated with either a trifluralin product or Edge (ethalfluralin). This condition includes application made in the previous year.

    Rate: Heritage: 4.5 kg/ac. Advance 10G: 2.25 kg/ac.

Hoe-Grass II *(diclofop methyl + bromoxynil)*

Group 1,6

Manufacturer: **Bayer CropScience**

CAUTION POISON

1. **Formulations:** Emulsifiable liquid; 230 g/L diclofop-methyl + 80 g/L bromoxynil; 20 L, 110L, 400L containers.
2. **Registered Mixes:** Decis: barley (except Betzes and Klages), flax, wheat. MCPA (Amine or Ester) **(only 28 mL/ac):** barley (except Betzes and Klages), spring rye, triticale, wheat.

    Caution: Do not exceed, under any circumstances, the recommended amount of MCPA as a severe reduction in grassy weed control will result.

3. **Crops:** Barley (8.4)(except Betzes and Klages), durum wheat (8.8), flax (7.6), spring rye (9.0), spring wheat (8.7), triticale (9.0).

    Seedling grasses (seed production only): Bromegrass, creeping red fescue, crested intermediate wheatgrass, Russian wild ryegrass.

    Underseeding: Do not treat crops underseeded to legumes.

4. **Weeds Controlled:**

barnyard grass (9.0)
common groundsel (9.0)
cow cockle (7.9)
green foxtail (7.4)
green smartweed (8.8)
knawel
kochia (8.2)
lady's-thumb
lamb's-quarters (7.0)
night-flowering catchfly (8.8)
Persian darnel (6.9)
redroot pigweed (7.2)
Russian thistle (8.2)
scentless chamomile (8.7)
stinkweed (8.2)
tartary buckwheat (7.2)
volunteer corn (8.4)
wild buckwheat (8.0)
wild mustard (8.3)
wild oats (7.4)
yellow foxtail

5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Barley (except Betzes and Klages): 1 - 4 leaf and prior to tillering. Application beyond the 4 leaf stage or after tillering will result in crop damage.

   Flax: 5 - 10 cm in height. During periods of stress [for example, very hot temperatures (28°C or 82°F)] or high humidity, flax may show leaf burn, retarded growth and a slight maturity delay. Avoid spraying flax under these conditions. Early evening spraying has been shown to be best.

   Wheat: No leaf stage restrictions.

   Grasses: 2 - 5 leaf stage.

   Weed stage: Barnyard grass, foxtail, wild oats: 1 - 4 leaf. Persian darnel: 1 - 3 leaf. Volunteer corn: 15 - 25 cm. Broadleaf weeds: seedling to early 4 leaf stage. Russian thistle: seedling to 5 cm in height.
7. **How to Apply:**

   With: Ground equipment only. Do not apply by air.

   Rate: 1.4 L/ac.

   Water volume: 45 L/ac.

   Pressure: 275 kPa.

   Nozzles: Only flat fan nozzles recommended.
8. **Application Tips:** For best results and maximum yield enhancement, apply when majority of weeds are in the 2 - 3 leaf stage. During periods of stress, plants are not actively growing. When daytime temperatures are very hot (28°C or 82°F) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Hoe-Grass during these periods may result in substantially reduced control. Under these conditions, yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. Good spray coverage and penetration may be difficult if weed populations are extremely high. Apply the spray at a forward angle of 45° and ensure that weeds are young and actively growing. Hoe-Grass II must be applied at least 4 days before the use of any other herbicide to eliminate a reduction of control.
9. **How it Works:** Diclofop-methyl possesses contact as well as systemic action. Uptake is primarily through the leaves. The site of action is the growing point. Bromoxynil is primarily a contact herbicide with limited translocation in susceptible annual broadleaf weeds.
10. **Expected Results:** Yellowing of susceptible plants is visible within 2 - 4 days. New leaf growth exhibits light chlorosis which deepens, and browning develops within 10 - 14 days of application. Photosynthesis and growth are inhibited and uptake of water and nutrients ceases. Lack of adequate crown root development is one of the most distinguishable features of diclofop-methyl activity. Bromoxynil activity is evident within 24 hours as necrotic spots appear on the leaves of susceptible broadleaf weeds. This damage spreads rapidly until the plants ultimately die. Chlorosis may develop in the untreated leaves of these susceptible weeds even though very little movement of the bromoxynil occurs.

    Precautions:

    Barley: Under certain environmental conditions, yellow blotches may appear on the barley leaves. These blotches will be rapidly outgrown and will not affect maturity or yield.
11. **Effects of Rainfall:** Rainfall within 1 hour will decrease activity.
12. **Movement in Soil:** Some movement may occur if sufficient moisture is present.
13. **Cropping Restrictions:**

    Succeeding crops: No restriction.

    Grazing restrictions: Do not graze treated fields prior to harvest.

    Drift: Avoid treatment near susceptible crops.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD$_{50}$ (rats) = 2,350 mg/kg. Eye irritant. Toxic to fish. A small amount of vomited liquid inhaled can be fatal. May cause burns to the skin and eyes.

Hoe-Grass II (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Do not store below freezing. If stored for 1 year or longer, shake well before using.
17. **Resistance Management:** Hoe-Grass II is both a Group 1 and a Group 6 herbicide. Any weed population may contain or develop plants naturally resistant toHoe-Grass II and other Group 1 and 6 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Hoe-Grass 284 *(diclofop methyl)*

Group 1

Manufacturer: Bayer CropScience

DANGER CORROSIVE

1. **Formulations:** Emulsifiable liquid; 284 g/L; 20 L, 110 L, 400 L containers.
2. **Registered Mixes:** Lontrel (227 mL/ac only)(canola), Pardner [barley*, flax, wheat (durum, spring)], Decis [barley*, canola, flax, mustard, potatoes, wheat (durum, spring, winter)].

    Note: *Barley (except Betzes or Klages).

    Mixing restrictions: Mixing with any broadleaf herbicide other than those registered on the Hoe-Grass 284 label will result in a reduction of grassy weed control.
3. **Crops:**

    barley (8.2)
      (except Betzes, Klages)
    canola (8.9)
    carrots
    dry common beans (8.8)
    (only black, pinto, white)
    dry bulb onion (8.6)
    durum wheat (8.9)
    fababeans (9.0)
    fall rye (9.0)
    field peas (9.0)
    flax (8.9)
    lentils (8.4)
    potatoes (8.7)
    processing peas (9.0)
    snap beans
    soybeans (8.8)
    spring rye (8.7)
    spring wheat (8.5)
    sugar beets (8.5)
    sunflowers (8.6)
      (except Corona)
    tame buckwheat (8.6)
    tame mustard (8.9)
    triticale (8.5)
    winter wheat (8.9)

    Forages, only in year of establishment

    aflalfa (8.5)
    alsike clover**
    bromegrass (7.5)
    creeping red fescue (7.9)
    crested wheatgrass (7.3)
    intermediate wheatgrass
    red cover (8.0)
    Russian wild ryegrass (7.6)
    sainfoin**
    sweet clover (8.0)

    ** Seedling legumes for seed production only.
4. **Weeds Controlled:** Barnyard grass (8.0), green foxtail (7.6), Persian darnel (6.8), volunteer corn (8.4), wild oats (7.7), yellow foxtail.
5. **Weeds Suppressed:** None.
6. **When Used:**

    Crop stage: Barley: 1 - 4 leaf, prior to tillering.

    Forages: Only in year of establishment; cannot use for food or feed.

    Wheat: No leaf stage restrictions.

    Weed stage: Barnyard grass, foxtail, wild oats: 1 - 4 leaf. Persian darnel: 1 - 3 leaf. Volunteer corn: 15 - 25 cm.

7. **How to Apply**:

With: Aircraft or ground equipment. Do not use controlled droplet application equipment.

Rate: 1.0 - 1.13 L/ac.

Beans, carrots, fababeans, onions, potatoes, soybeans, sugar beets: 1.4 L/ac.

Wild oats in 4 - 5 leaf stage: 1.1 L/ac.

When tank mixing: 1.13 L/ac, except with Decis 1.0 - 1.13 L/ac.

Water volume: Air: 14 L/ac minimum. Ground: 45 L/ac.

Pressure: Air: 300 kPa. Ground: 275 kPa.

Nozzles: Only flat fan recommended.

8. **Application Tips**: Do not use on Betzes and Klages barley. When tank mixing with bromoxynil, do not delay Hoe-Grass 284 application if grassy weed is in correct stage. Reduced control can be expected if Hoe-Grass 284 is applied to weeds growing under stress. Control may be further reduced if tank mixed. Apply at least 4 days before any broadleaf herbicide, except bromoxynil products, to eliminate a reduced grass kill from Hoe-Grass 284. Not recommended to apply Hoe-Grass 284 after a broadleaf herbicide, during periods of stress, plants are not actively growing, when daytime temperatures are very hot (28°C or 82°F) and/or conditions are very dry and/or there is low humidity. Application of Hoe-Grass during these periods may result in substantially reduced control. Under these conditions, yellow blotches may appear on crop leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. Good spray coverage and penetration may be difficult if weed populations are extremely high. Apply the spray at a forward angle of 45°, and ensure that weeds are young and actively growing.

9. **How it Works**: Contact as well as systemic action. Uptake primarily through leaves and translocated to growing point. Penetration and uptake via roots may occur if soil is sufficiently moist and the rate of application is relatively high.

10. **Expected Results**: Yellowing of susceptible plants is noticeable within 2 - 4 days of application. New leaf growth exhibits light chlorosis which deepens, and browning develops 10 - 14 days after application. Photosynthesis and growth are inhibited and uptake of water and nutrients ceases. Lack of adequate crown root development is evident on wild oats as well as in some sensitive barley varieties.

11. **Effects of Rainfall**: Rainfall within 1 hour will decrease activity.

12. **Movement in Soil**: Some movement in soil if sufficient moisture is present.

13. **Cropping Restrictions**:

Succeeding crops: No restriction.

Drift: Danger from drift is low.

Grazing restrictions: Do not graze treated fields prior to harvest. Do not apply within 60 days of harvest.

14. **Toxicity**: Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 2,350 mg/kg. Toxic to fish. Non-toxic to birds. A small amount of vomited liquid inhaled can be fatal.

15. **Precautions, First Aid**: Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage**: Do not store below freezing. If stored 1 year or longer, shake well before using.

17. **Resistance Management**: Hoe-Grass 284 is a Group 1 herbicide. Any weed population may contain or develop plants naturally resistant to Hoe-Grass 284 and other Group 1 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Horizon *(clodinafop propargyl)*

Group 1

Manufacturer: Syngenta Crop Protection Canada Inc.

CAUTION POISON

1. **Formulations:** Emulsifiable concentrate; 240 g/L; 1 x 3.68 L Horizon + 2 x 6.4 L Score.
2. **Registered Mixes: Horizon tank mixes**: Ally (3 g/ac), Attain (Attain A 240 mL/ac + Attain B 400 mL/ac), 2,4-D Amine 500 (340 mL/ac), Buctril M (400 mL/ac), Curtail M (800 mL/ac), Decis flowable (32 - 48 mL/ac), Dichlorprop D (700 mL/ac), DyVel (500 mL/ac), Estaprop (700 mL/ac), Lontrel (170 - 340 mL/ac), Lontrel + MCPA Ester 500 (110 - 170 mL/ac + 450 mL/ac), Lontrel 360EC + Refine Extra (85 mL/ac + 8 g/ac), Matador (25 - 34 mL/ac), MCPA Amine, MCPA Ester 500 (340 - 440 mL/ac), MCPA Na-salt (485 mL - 1.09 L/ac), Mecroprop (2.2 - 2.8 L/ac), Mextrol (567 mL/ac), Pardner (400 mL/ac), Prestige: Prestige A (324 mL/ac), Prestige B (810 mL/ac), Refine Extra (8 g/ac), Target (400 - 600 mL/ac), Thumper (400 mL/ac), Tilt (202 mL/ac), Trophy (240 mL/ac Strane + 450 mL/ac MCPA Ester), Turboprop 600 (700 mL/ac), Unity (202 mL/ac + 4.3 g/ac).
3. **Crops:** All types of durum and spring wheat.
4. **Weeds Controlled:** Barnyard grass, green foxtail, Persian darnel, volunteer canary seed, volunteer oats, wild oats, yellow foxtail.
5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Apply prior to emergence of the 4th tiller. When tank mixing, always refer to the label of the broadleaf partner herbicide.

   Weed stage:

   Green and yellow foxtail, Persian darnel, barnyard grass: 1 - 5 true leaves on the main stem. (For optimum control, apply before tillering and when Persian darnel and barnyard grass are actively growing. For optimum control of green and yellow foxtail, apply prior to emergence of 3rd tiller and while foxtail is actively growing.)

   Volunteer oats: 3 - 6 true leaves on the main stem and prior to emergence of the 4th tiller.

   Wild oats and volunteer canary seed: 1 - 6 true leaves on the main stem and prior to emergence of the 4th tiller.
7. **How to Apply:**

   With: Ground equipment. Do not apply by aircraft.

   Rates:

   Wild oats, green and yellow foxtail, barnyard grass, volunteer oats, volunteer canary seed: 95 mL/ac + Score (0.8 % v/v).

   Above weeds + Persian darnel: 115 mL/ac + Score (1.0% v/v).

   Water volume: 40 L/ac.

   Pressure: 275 - 310 kPa.

   Nozzles: 80° or 110° flat fan stainless steel nozzles are recommended for optimal spray coverage.

   Mixing instructions:

   1. Clean spray tank and 1/2 fill with clean water. Start agitation or bypass system.
   2. If a broadleaf herbicide is to be tank mixed, add the product **first** prior to adding Horizon and agitate for 2 - 3 minutes.
   3. Add correct amount of Horizon.
   4. Agitate for 2 - 3 minutes.

5. Add correct amount of Score Adjuvant.
6. Agitate for 1 - 2 minutes before adding remainder of water.
7. After any break in spraying operations, agitate thoroughly before spraying again.
8. Use the spray suspension as soon as it is prepared.
9. If an oil film starts to build-up in the tank, drain tank and then clean with a detergent.

Sprayer cleanup: Thoroughly clean application equipment immediately after spraying. Ensure all traces of the product are removed. The following recommendations are provided:

1. Drain and flush tank walls, boom and all hoses for ten minutes with clean water. Do not clean the sprayer near desirable vegetation, wells or other water sources.
2. Remove the nozzles and screens and wash separately.
3. Dispose of all rinsings in accordance with provincial regulations.
4. If a broadleaf tank mix partner is used, always check tank mix partner label for any additional cleanup procedures.

8. **Application Tips:** For optimum results, apply Horizon to actively growing weeds. An early application will maximize crop yields by reducing weed competition. Application of the spray mixture at a 45° angle in the direction of travel will result in improved spray coverage. Do not use flood type nozzles, controlled droplet application equipment, spray foils or hollow cone nozzles. Weeds emerging after application will not be controlled. Do not apply to crop stressed by conditions such as frost, low fertility, drought, flooding, disease or insect damage as crop injury may result.

9. **How it Works:** Horizon is absorbed by the leaves and is rapidly translocated to the growing points of leaves and stems. Thorough coverage of the plants is essential for consistent control.

10. **Expected Results:** Grassy weeds – Depending on species, growing conditions and crop competition, leaves and growing points turn yellow within one to three weeks after application. Further colour changes and loss of vigor will be observed, followed by a browning and complete control 3 - 5 weeks after application.

11. **Effects of Rainfall:** Rainfall within 30 minutes of application may reduce the effectiveness of Horizon.

12. **Movement in Soil:** None.

13. **Cropping Restrictions:** Do not treat wheat underseeded to forages.

    Grazing restrictions: Observe a minimum of 3 days before grazing livestock on crops treated with Horizon.

    Pre-harvest interval: 60 days.

14. **Toxicity:** Acute Oral LD_{50} (rats) = 2,276 mg/kg; Acute dermal (rats) = 4,000 mg/kg.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store the product in closed, original container in a well ventilated room.

17. **Resistance Management:** Horizon is a Group 1 herbicide. Any weed population may contain or develop plants naturally resistant to Horizon and other Group 1 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Horizon BTM *(clodinafop propargyl + bromoxynil + MCPA Ester)*

Group 1,6,4

Manufacturer: Syngenta Crop Protection Canada Inc.

CAUTION POISON

1. **Formulations:**
    1. Horizon 240 EC: clodinafop-propargyl 240 g/L emulsifiable concentrate; 1 x 1.84 L.
    2. Buctril M 560 EC: bromoxynil 280 g/L + MCPA 280 g/L.
    3. Score Adjuvant: 1 x 6.4 L.
2. **Registered Mixes:** None.
3. **Crops:** Durum wheat and spring wheat.
4. **Weeds Controlled:**

Wild oats: 1 - 6 leaf prior to emergence of 4th tiller.

Green foxtail: 1 - 5 leaf prior to emergence of 3rd tiller.

Barnyard grass, green foxtail, volunteer canary seed, volunteer tame oats, yellow foxtail.

Seedlings up to 4 leaf stage

American nightshade
ball mustard
bluebur
cocklebur
cow cockle*
flixweed
green smartweed
kochia**
lady's-thumb
night flowering catchfly
pale smartweed
redroot pigweed
Russian thistle**
scentless chamomile***
shepherd's-purse
velvetleaf****
volunteer canola
volunteer sunflower

Seedlings up to 6 leaf stage

wild tomato

Seedlings up to 8 leaf stage

buckwheat (wild, tartary, common)
common groundsel
common ragweed
lamb's-quarters
stinkweed
wild mustard
wormseed mustard

* In normal conditions, cow cockle will be controlled up to the 4 leaf stage. Plants beyond this stage are unlikely to be controlled.
** Spray before plants are 5 cm.
*** Spring annuals only.
**** Spray before plants are 8 cm high.

5. **Weeds Suppressed:** Canada thistle, perennial sow-thistle.
6. **When Used:**

Crop stage:

Spring and durum wheat: 2 leaf prior to emergence of 4th tiller.

Weed stage:

Wild oats: 1 - 6 leaf stage prior to emergence of 4th tiller.

Green foxtail: 1 - 5 leaf stage prior to emergence of 3rd tiller.

Broadleaf weeds: Buckwheats, groundsel, lamb's-quarters, ragweed, stinkweed, wild mustard, wormseed mustard up to 8 leaf stage. Wild tomato up to 6 leaf stage. All other broadleaf weeds up to 4 leaf stage.

7. **How to Apply:**

With: Ground equipment. Do not apply by air.

Rate: Horizon 240 EC: 93 mL/ac. **Buctril M 560 EC:** 400 mL/ac. **Score Adjuvant:** 0.8% v/v.

Water volume: Minimum of 40 L/ac.

Nozzles: 80° or 110° flat fan. Use 50 mesh nozzle screens.

Pressure: 275 kPa.

Mixing instructions:

1. Clean spray tank and add 1/2 amount of clean water. Start agitation.
2. Add correct amount of Buctril M 560 EC.
3. Agitate for 2 - 3 minutes.
4. Add correct amount of Horizon 240 EC.
5. Agitate for 2 - 3 minutes.
6. Add correct amount of Score Adjuvant.
7. Agitate for 1 - 2 minutes.
8. Add remainder of water and then maintain constant agitation.
9. After any break in spraying operations, agitate thoroughly before spraying again.
10. Use the spray suspension as soon as it is prepared.

Sprayer cleanup: Thoroughly clean application equipment immediately after spraying. Ensure all traces of product are removed.

1. Drain and flush tank walls, boom and all hoses for 10 minutes with clean water. Do not clean sprayer near desirable vegetation, wells or other water sources.
2. Remove the nozzles and screens, and wash separately.
3. Dispose of all rinsings in accordance with provincial regulations.

8. Application Tips: For optimum results, apply Horizon BTM to actively growing weeds. An early application will maximize crop yields by reducing weed competition. Application of the spray mixture at a 45° angle in the direction of travel will result in improved spray coverage. Do not use flood type nozzles, controlled droplet application equipment, spray foils or hollow cone nozzles. Weeds emerging after application will not be controlled. Do not apply to crop stressed by conditions such as frost, low fertility, drought, flooding, disease or insect damage as crop injury may result.

9. How it Works: Horizon 240 EC is absorbed by the leaves and is rapidly translocated to the growing points of leaves and stems. Thorough coverage of the plants is essential for consistent control. Buctril M 560 EC – Bromoxynil is a contact-type herbicide; therefore, good spray coverage is essential. Inhibits photosynthesis and plant respiration. MCPA is absorbed through the leaves and is readily translocated in the plant.

10. Expected Results:

Wild oats: Actively growing wild oats stop growing within 48 hours after treatment. Depending on growing conditions and crop competition, leaves and growing points turn yellow within 1 - 3 weeks after application. Further colour changes and loss of vigour will be observed, followed by browning and complete control 3 - 5 weeks after application.

Broadleaf weeds: Small burnt spots on leaf can appear within hours; death can take up to two weeks.
Poor results may be expected as a result of poor coverage or poor penetration through the canopy.

11. Effects of Rainfall: Rainfall within 30 minutes of application may reduce the effectiveness of Horizon BTM.

12. Movement in Soil: None.

13. Cropping Restrictions:

Grazing restrictions: Do not use treated crops for grazing of livestock or green feed until 30 days after application of Horizon BTM. Do not cut treated crops for forage until 30 days after application of Horizon BTM.

Pre-harvest interval: 60 days.

14. Toxicity:

1. Horizon 240 EC: Acute Oral LD_{50} (rats) = 2,276 mg/kg; Acute dermal (rats) = 4,000 mg/kg.
2. Buctril M 560 EC: Acute oral LD_{50} (rats) = 365 mg/kg.

Horizon BTM (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store the product in closed, original container in well ventilated room.
17. **Resistance Management:** Horizon BTM is considered to be a Group 1, Group 4 and Group 6 herbicide. Any weed population may contain or develop plants naturally resistant to Horizon BTM and other Group 1, 4 and 6 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Hyvar X/X-L *(bromacil)*

Group 5

Manufacturer: DuPont Canada Inc.

1. **Formulations:** Wettable powder; Hyvar X; 80%; 2 kg, 25 kg bags. Water soluble liquid; Hyvar X-L; 240 g/L; 4 L, 10 L jugs.
2. **Registered Mixes:** None.

    Mixing instructions: Hyvar X: Weigh out proper amount of Hyvar X and mix into necessary volume of water (minimum 20 L/kg of Hyvar X). Agitate continuously by mechanical or hydraulic means.
3. **Crops:** Non-crop areas only. Total vegetation control.
4. **Weeds Controlled:** A non-selective, total vegetation control chemical for weeds, grasses and some brush.
5. **Weeds Suppressed:** Not applicable.
6. **When Used:** Just before or during the period of active weed growth. Do not apply when ground is frozen.

    Brush: Apply in spring or summer as a basal (spot) treatment.
7. **How to Apply:**

    Hyvar X-L:

    With: Power sprayer. Handguns, backpack sprayers or a watering can may be used to treat small areas.

    Rate:

    Initial treatment: Apply 12 - 18 L/ac. Higher dosage on soils containing 5% or more organic matter, or soils high in clay content.

    Retreatment of regrowth: 7 - 9 L/ac.

    Small areas: 450 mL/100 m^2.

    Brush control: Spot Treatment Undiluted: At 8 mL/m of tree height up to 3 m. Four or five 8 mL deposits around the root collar for brush taller than 3 m with a spot gun. Spot Treatment Diluted: mix 1 L in 5 L of water, apply in 55 mL deposits with a spot gun.

Hyvar X:

With: Same as Hyvar X-L, except more efficient agitation of the spray solution is required.

Rate:

Initial treatment: 3 - 5 kg/ac. Use the higher dosage on soils containing 5% or more organic matter, or soils high in clay content.

Retreatment of regrowth: 1.5 - 2.7 kg/ac.

Small areas: 135 g/100 m^2.

Brush control: Mix 870 g Hyvar X in 10 L of water and apply 30 - 60 mL/stem 5 - 10 cm in basal diameter. Wet base of stem to point of runoff.

Water volume: 100 - 1,000 L/ac. Use enough water to uniformly cover the area to be treated. Hyvar X-L: With a handgun, apply 650 L of spray solution/ac. Hyvar X: Minimum of 20 L of water/kg of Hyvar X.

Nozzles: Screens should be 50 mesh or larger.

8. **Application Tips:**

   Weed control: If dense growth is present, results will be improved if vegetation is removed before treatment. Do not apply closer then 1.5 times the height of nearby trees. Roots from large trees may extend well beyond the height of the tree and may extend beneath areas to be treated. Be cautious where trees are in close proximity to the treatment site. Do not apply to brush standing in water, lawns, walks, driveways, tennis courts or similar areas. Applying, draining or flushing equipment too near feeding roots of susceptible vegetation may cause injury. Thoroughly clean all traces of Hyvar from application equipment immediately after use.

9. **How it Works:** Hyvar X is readily absorbed through the roots but much less readily through the leaves. Once in the plant, it inhibits photosynthesis.

10. **Expected Results:** Susceptible plants become chlorotic and then die. Vegetation kill is faster with higher rainfall. Degree and duration of control depends on amount of chemical applied, soil type, rainfall and other conditions. Brush: final kill may not take place until the year following treatment.

    Poor results may be expected if weed growth too mature or if there is insufficient rainfall.

11. **Effects of Rainfall:** Rainfall will carry the chemical into the root zone where it is absorbed.

12. **Movement in Soil:** Movement in soil is dependent upon soil type and soil moisture. Bromacil will move faster in a vertical direction in sandy soils than in soils high in organic matter or clay content. Movement can be severe on slopes.

13. **Cropping Restrictions:**

    Drift: All crops and ornamentals may be injured by chemical drift. Do not apply in areas subject to severe soil erosion.

14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 5,200 mg/kg. Toxic to fish. Intake of Hyvar X-L can cause damage to lungs, liver, heart and kidney and can lead to a coma. May also cause blindness.

15. **Precautions, First Aid:** Hyvar X-L is combustible. While applying undiluted product, do not smoke and keep away from heat and open flame. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Hyvar X: Store in a cool, dry place. Hyvar X-L: Combustible, keep away from heat or open flame. Do not allow to freeze.

K2 *(thifensulfuron methyl + tribenuron methyl + flucarbazone sodium)*

Group 2

Manufacturer: DuPont Canada Inc.

1. **Formulations:**
   1. Refine Extra (dry flowable); 50% thifensulfuron methyl + 25% tribenuron methyl; 320 g (4 x 80 g) water-soluble bags.
   2. Everest (dry flowable); 70% flucarbazone-sodium; 696 g (4 x 174 g) water-soluble packets.
2. **Registered Mixes:** K2 **must** be applied with 2,4-D Amine at 340 mL to 450 mL/ac (based 500 g/L formulation) + 0.25% v/v of a recommended surfactant.
3. **Crops:** All spring wheat varieties.
4. **Weeds Controlled:**

K2 + 2,4-D tank mix

ball mustard
burdocks (seedlings)
chickweed
cocklebur
common groundsel
common plantain
common ragweed
corn spurry
cow cockle
false ragweed
flixweed
giant ragweed
green foxtail*
green smartweed
hare's-ear mustard
hemp-nettle
Indian mustard
kochia
lady's-thumb
lamb's-quarters
narrow-leaved hawk's-beard
prickly lettuce
redroot pigweed
Russian pigweed
Russian thistle
shepherd's-purse
stinkweed
sweet clover
tumble mustard
volunteer rapeseed**
volunteer sunflower
wild buckwheat
wild mustard
wild oats***
wild radish
wormseed mustard

* Includes Group 1 and 3 resistant green foxtail.
** Includes CLEARFIELD Canola when applied with 2,4-D Amine.
*** Includes Group 1 and 8 resistant wild oats.

5. **Weeds Suppressed:** Canada thistle, cleavers, round-leaved mallow (2 - 6 leaf), scentless chamomile, sow-thistle, stork's-bill (2 - 6 leaf), toadflax (less than 15 cm tall).
6. **When Used:**

Crop stage:

Wheat: Apply when wheat has a minimum of 1 leaf, up to a maximum of 4 leaves, on the main stem with two tillers.

Weed stage: Apply to young, actively growing weeds before canopy closes. Weeds emerging after treatment may not be controlled.

Canada thistle, sow-thistle: Apply when the majority of the thistles have emerged and are actively growing. For best top growth control, apply when thistles are not larger than 15 cm tall, before bud stage and before crop canopy prevents thorough coverage of the thistles. A single application will effectively inhibit the ability of emerged thistles to compete with the crop. Later emerging thistles will not be controlled.

Chickweed: Apply when the chickweed is small (1 - 6 leaf) and actively growing, but before crop canopy prevents thorough coverage of weeds. Chickweed emerging after application will not be controlled.

Cleavers: 1 - 3 whorls.

Green foxtail: 1 - 6 leaf (4 leaves on the main stem + 2 tillers).

Round-leaved mallow: Apply to actively growing round-leaved mallow in the 2 - 6 leaf stage (10 - 12 cm in height). K2 will keep mallow stunted, but may not reduce the overall populations.

Wild buckwheat: 1 - 3 leaf.

Wild oats: 1 - 6 leaf (4 leaves on the main stem + 2 tillers).

Application outside this window may result in crop injury and/or loss of weed control.

7. How to Apply:

With: Ground equipment. Do not apply by air.

Rate: 8 g/ac Refine Extra + 17.4 g/ac Everest + 340 - 450 mL/ac 2,4-D Amine (500 g/L formulation) + 0.25 L per 100 L of spray solution of Agral 90 or Ag-Surf.

Water volume: 45 L/ac.

Pressure: 207 – 276 kPa.

Nozzles: Flat fan recommended at 80° or 110°. Use 50 mesh or larger screens.

Mixing instructions:

1. Fill the spray tank 3/4 full with clean water and begin agitation or by-pass.
2. Add the required number of Everest pouches as determined by the rate directly to the spray tank. Depending on the water temperature and the degree of agitation, the packets should be completely dissolved within approximately 5 - 10 minutes from the time they were added to the water. Maintain sufficient agitation during both mixing and application.
3. Add the required number of Refine Extra pouches.
4. Add the required amount of 2,4-D.
5. Add the required amount of surfactant, then complete filling the tank with the balance of the water needed.

Sprayer cleanup: K2 can cause severe injury to sensitive crops at very low concentrations. Sprayers used to spray K2 should be flushed out immediately before using another product. Follow the steps below:

1. Drain the tank and thoroughly rinse the spray tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect the tank to ensure removal of all visible residues of K2.
2. Fill the tank with clean water and 1% v/v (1 L/100 L) household ammonia. Flush the hoses, boom and nozzles with the solution, and then add more water and ammonia to completely fill the tank so that all surfaces are in contact with the solution. Allow to sit for 15 minutes with agitation. Flush hoses, boom and nozzles once more, then drain the tank.
3. All nozzles, screens and filters should be removed and cleaned after applying this product. Clean nozzles and screens in a separate container using the ammonia and water solution.
4. Repeat step #2.
5. Rinse tank, boom and hoses with clean water for a minimum of 5 minutes.

Do not clean sprayer near desirable vegetation, wells or other water sources. Dispose of all rinsings in accordance with provincial regulations.

8. Application Tips: Wheat exposed to the following conditions at application time may result in unacceptable levels of injury: water-logged or saturated soils, temperature extremes such as heat or freezing weather, drought, low fertility or plant disease. Weed control may also be reduced by these same conditions. Under certain conditions (heavy rainfall, prolonged cool weather, frost conditions, wide fluctuations in day/night temperature), lightening in crop colour and reduction in crop height may occur.

9. How it Works: K2 is a systemic herbicide that is absorbed by both leaves and roots and moves rapidly into the growing point of the plant. Inhibits cell elongation.

10. Expected Results: Growth of susceptible plants stops soon after application. Symptoms include discolouration (yellowing, purpling, and reddening) of newest leaves, and complete control may not be observed for 1 - 2 weeks.

11. Effects of Rainfall: Rainfall within 6 hours of application may reduce degree of weed control.

K2 (cont'd)

12. **Movement in Soil:** Refine Extra moves little in the soil and disappears from the soil quickly.
13. **Cropping Restrictions:** The following crops may be planted 11 months after an application:

    Black, Dark Brown and Grey Wooded soil zones: Spring wheat, barley, canola and field peas.

    Brown soil zone: Spring wheat.

    Grazing restrictions: Do not graze treated fields. Mature grain or straw may be fed to livestock.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place. K2 is not affected by freezing, but the water-soluble bags may become brittle and break if handled roughly. Avoid physical damage to water-soluble packets during storage and prior to mixing in the spray tank.
17. **Resistance Management:** K2 is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to K2 and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Karmex DF/Diurex 80W *(diuron)*

Group 7

Manufacturer: **DuPont Canada Inc., United Agri Products**

1. **Formulations:** Dry flowable; 80%; 2 kg, 25 kg packs.
2. **Registered Mixes:** None.

    Mixing instructions: Agitate continuously by mechanical or hydraulic means.
3. **Crops:** Asparagus, dug-outs, irrigation and drainage ditches, ponds and spot treatment for general weed control. Non-crop areas.
4. **Weeds Controlled:** Broadleaf and grassy weed seedlings.
5. **Weeds Suppressed:** Not applicable.
6. **When Used:** May be used at any time, except when the ground is frozen. Best results obtained when applied shortly before weed growth begins. Dense weed growth should be removed first, then treatment applied. Sufficient rainfall or irrigation is necessary following treatment to carry the chemical to the root zone.

    Asparagus (established): No earlier than 4 weeks before spear emergence and no later than the early cutting period.

    Irrigation and drainage ditches: Before expected seasonal rainfall, if possible, when soil in the ditch is still moist. Apply during the non-crop season when the ditch is not in use.

7. **How to Apply:**

   With: Field sprayer, hand sprayer, back-pack or sprinkling can.

   Rate:

   General weed control: Sandy or sandy loam soils 5.8 - 11 kg/ac. Clays or high organic soils 16 - 22 kg/ac. Use the lower rate when annual weed growth predominates and where only one season's control is desired.

   Retreatment of regrowth: Annuals and seedlings 500 g/ac.

   Irrigation and drainage ditches: 250 - 750 g/100 m^2 or 9.3 - 27 kg/ac. Flush once before using for irrigation purposes. Karmex must be fixed in the soil by moisture to minimize movement in irrigation water.

   Spot treatment: Quackgrass, toadflax 0.75 - 1.0 kg/100 m^2.

   Small areas: 50 g/10 m^2 is equal to 20.2 kg/ac.

   Water volume: Use 100 - 160 L of water/acre to provide thorough, uniform coverage.

   Nozzles: Screens should be 50 mesh or larger.

8. **Application Tips:** Do not use on sand, loamy sand or gravelly soils with less than 1% organic matter. Spray booms must be shut off while starting, turning, slowing or stopping as injury to the crop may result. Do not apply to newly seeded asparagus or to young plants during the first growing season after setting or on plants with exposed roots as severe injury may result. **Do not apply to slopes as soil erosion may occur.** Applying, draining or flushing equipment too near feeding roots of susceptible vegetation may cause injury. Do not use on lawns, walks, driveways, tennis courts or similar areas. Thoroughly clean all traces of Karmex from application equipment after use.

9. **How it Works:** Diuron is readily absorbed through the root system and less readily absorbed through stem and foliage.

10. **Expected Results:** Susceptible plants become chlorotic soon after treatment and then die. Degree of control and duration of effect will vary with the amount of chemical applied, soil type, rainfall and other conditions. Regrowth of plantain, thistle, or wild carrot will indicate that retreatment is necessary. **Poor control may be expected if** inadequate rate or weeds too old or insufficient rainfall.

11. **Effects of Rainfall:** Rainfall will activate the chemical, carrying it into the root zone.

12. **Movement in Soil:** Diuron absorbs readily to the soil, and there is little movement by leaching.

13. **Cropping Restrictions:**

    Drift: All crops and ornamentals may be injured by chemical drift.

    Succeeding crops: Do not replant treated areas to any crop within 2 years after last treatment as injury to subsequent crops may result.

14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 3,400 mg/kg. Non-toxic to birds and fish.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a cool, dry place.

17. **Resistance Management:** Karmex DF/Diurex 80W is a Group 7 herbicide. Any weed population may contain or develop plants naturally resistant to Karmex DF/Diurex 80W and other Group 7 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Kerb 50W *(propyzamide)*

Group 15

Manufacturer: Dow AgroSciences Canada Inc.

CAUTION POISON

1. **Formulations:** Wettable powder; 50%; 1.36 kg bag (containing 3 x 454 g pouches). **Order directly from Univar.**
2. **Registered Mixes:** None specified.
3. **Crops:** Alfalfa (established)(8.7), bird's-foot trefoil (established), grass (established), pastures (grass/legume).
4. **Weeds Controlled:**

chickweed (8.2)
dodder
foxtail barley (7.5)
grasses (most annual) (8.3)
orchard grass (8.3)
seedling quackgrass (7.4)
timothy
volunteer barley
volunteer wheat
wild oats (5.9)

5. **Weeds Suppressed:** None.
6. **When Used:**

Fall: Alfalfa, bird's-foot trefoil. Apply between October 1 and freeze-up. Best results are obtained when soil temperature is low but above freezing, and soil moisture is high.

Spring: Alfalfa (grown for seed). For optimum control, the soil temperature should be cool.

7. **How to Apply:**

With: Ground equipment only.

Rate:

Fall	g/ac
Alfalfa, bird's-foot trefoil (established)	
– annual grasses, volunteer grain, wild oats	710
– chickweed, orchard grass, quackgrass, timothy	910 - 1310
Pasture established on Brown, Dark Brown, Grey Wooded soils	
– foxtail barley	275 - 365
Pasture established on Black and Thin Black soils	
– foxtail barley	365 - 455
Spring	**g/ac**
Alfalfa (grown for seed)	
– annual grasses, volunteer grain, wild oats	710 (maximum)
– chickweed, orchard grass, quackgrass, timothy	910 (maximum)

Water volume: 120 - 200 L/ac.

Pressure: 275 kPa.

Nozzles: Flat fan. 50 mesh or larger metal filters and nozzle screens.

Incorporation: None. Spring application on alfalfa, if soil temperature is high and moisture content low, a light incorporation is recommended.

8. **Application Tips:** Do not use on highly organic peat or muck soils. Avoid application to timothy, fescue, crested wheat grass or perennial bluegrass. In fall, rain in 1 or 2 days or a light overhead irrigation (1.25 - 2.5 cm) improves results.
9. **How it Works:** Root absorption. Inhibits cell division.
10. **Expected Results:** Plant growth stops; plant turns brown and dies.

11. **Effects of Rainfall:** Improves efficacy.
12. **Movement in Soil:** Very little leaching. Readily absorbed on organic matter.
13. **Cropping Restrictions:** Wait 9 months before planting other crops.

    Grazing restrictions: Do not harvest or graze within 90 days of applying 1.3 kg/ac or 60 days after lower rates.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 5,620 - 8,350 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in cool, dry place.
17. **Resistance Management:** Kerb 50W is a Group 15 herbicide. Any weed population may contain or develop plants naturally resistant to Kerb 50W and other Group 15 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Krenite *(fosamine)*

Manufacturer: DuPont Canada Inc.

1. **Formulations:** Water soluble liquid; 480 g/L; 10 L pack.
2. **Registered Mixes:** None.

   Non-ionic surfactants: Tween 20.
3. **Crops:** Brush control on non-crop areas only.
4. **Weeds Controlled:**

   alder
   ash
   balsam fir*
   beech
   birch
   cherry*
   elm
   hazel
   hemlock*
   largetooth aspen*
   maple
   oak
   pine
   trembling aspen poplar
   white spruce*

   * Highest rate.
5. **Weeds Suppressed:** Not applicable.
6. **When Used:** From mid-June to end of July.
7. **How to Apply:**

   With: High volume ground equipment.

   Rate: 10.0 - 15.0 L/1,000 L of water. Add 1 - 2 L of surfactant to the mixture. Use higher rate for balsam fir, cherry, hemlock, largetooth aspen, white spruce.

   Water volume: 200 - 1,200 L of spray solution/ac to point of runoff.

   Nozzles: Flat fan recommended.
8. **Application Tips:** Do not apply to food crops. A non-ionic surfactant is required to control most conifers and to control the root suckering of deciduous brush.
9. **How it Works:** Absorbed by leaves, stems and buds. Restricts bud development the following spring.

Krenite (cont'd)

10. **Expected Results:** Injury may not be observed until the following spring, particularly if minimum rates are used or if cool temperatures prevail when spraying is done. Plants will fail to develop leaves and subsequently die.
11. **Effects of Rainfall:** Rainfall within 24 hours of application may reduce effectiveness.
12. **Movement in Soil:** Little downward movement as Krenite readily adsorbs to soil colloids.
13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze on land treated with Krenite.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 24,000 mg/kg. Non-toxic to birds and fish.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. If **swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place.

Krovar I *(bromacil + diuron)*

Group 5,7

Manufacturer: **DuPont Canada Inc.**

1. **Formulations:** Dry flowable; 40% bromacil + 40% diuron; 2 kg, 25 kg bags.
2. **Registered Mixes:** Telar at 48 g/ac + surfactant.

    Mixing instructions: Weigh out the proper amount of Krovar and mix into necessary volume of water (minimum 20 L water/kg of Krovar). Agitate continuously by mechanical or hydraulic means. Do not use air agitation. If mixing with Telar, add the Telar first, then the required amount of Krovar, then surfactant.
3. **Crops:** Non-crop areas only. Total vegetation control.
4. **Weeds Controlled:** Most annual and perennial weeds and grasses.
5. **Weeds Suppressed:** Not applicable.
6. **When Used:**

    Weed stage: Before weeds emerge or when actively growing. Remove dense growth before treatment. Do not apply when ground is frozen. Sufficient moisture is required to carry the chemical to the root zone of the weeds.
7. **How to Apply:**

    With: Boom sprayer, handgun, back pack or sprinkling can.

    Rate:

    General weed control: 5.3 - 7.3 kg/ac. Use higher rates on soils containing 5% or more organic matter or soils high in clay content. Use 5.5 kg/ac on sandy or sandy loam soils only.

    Retreatment of regrowth: 2.75 - 3.6 kg/ac when annual weeds reappear on previously treated sites.

    Small areas: 180 g/100 m², approximately 7.3 kg/ac.

    Water volume: 20 L water (minimum)/kg of Krovar I. 100 - 1,000 L/ac. Use enough water to uniformly cover area to be treated.

    Nozzles: Screens should be 50 mesh or larger.

8. **Application Tips:** Applying, draining or flushing equipment too near feeding roots of susceptible vegetation may cause injury. Do not use on lawns, walks, driveways, tennis courts or similar areas. **Do not apply to slopes as soil erosion may occur.** Thoroughly clean all traces of Krovar I from application equipment immediately after use.
9. **How it Works:** Readily absorbed through the roots, leaves and stems.
10. **Expected Results:** Plants become chlorotic and then die. The degree of control and duration of effect will vary with the amount of chemical applied, soil type, rainfall and other factors. **Poor results occur if** weeds are too mature or if insufficient rainfall.
11. **Effects of Rainfall:** Rainfall will leach the chemical into the root zone.
12. **Movement in Soil:** Movement in soil is faster with heavier rainfall. Do not use in areas subject to soil erosion.
13. **Cropping Restrictions:**

    Drift: All crops and ornamentals may be injured by chemical drift.

    Succeeding crops: Krovar I is a non-selective residual herbicide. It should only be used on non-crop areas where bare ground is desired.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = bromacil 5,200 mg/kg, diuron = 3,400 mg/kg. Non-toxic to birds. Toxic to fish.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. If **swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place.
17. **Resistance Management:** Krovar I is a Group 5 and 7 herbicide. Any weed population may contain or develop plants naturally resistant to Krovar I and other Group 5 and 7 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed *(see page 38 - 42).*

Laddok *(bentazon + atrazine)*

Group 6,5

Manufacturer: **BASF Canada**

CAUTION POISON

1. **Formulations:** Liquid suspension; 200 g/L bentazon + 200 g/L atrazine; 1 x 10 L Laddok + 1 x 8 L Assist oil concentrate.
2. **Registered Mixes:** None.

    Surfactant: Assist oil concentrate.
3. **Crops:** Field corn, seed corn, silage corn, sweet corn. Seed corn producers should consult the seed corn company regarding tolerance of seed production lines to Laddok + Assist oil concentrate.

Laddok (cont'd)

4. **Weeds Controlled:**

annual smartweeds
bird rape*
black nightshade
buttercup
cocklebur
common chickweed
common groundsel*
common ragweed
corn spurry
giant ragweed*
hairy galinsoga
lady's-thumb
lamb's-quarters*
low cudweed
purslane
redroot pigweed*
Russian thistle
velvetleaf
wild mustard

* Triazine resistant strains of these weeds are controlled by Laddok.

5. **Weeds Suppressed:** None.

6. **When Used:** **Crop stage:** Corn is tolerant to Laddok at all stages of growth.

   Weed stage: Apply early post-emergence when weeds are small and actively growing (usually corresponds to corn growth stages of 1 - 5 leaves). Under good growing conditions, the most effective time for application usually is 18 - 28 days after planting. Cultivation may be necessary if additional weeds emerge after the application.

7. **How to Apply:**

   With: Ground equipment.

   Rate: 1.2 - 1.6 L/ac. Use the rate appropriate for weed size as shown in the application rate table of the Laddok label. Where **Dual II Magnum** has been applied as a pre-emergent grass herbicide, the application rate of Laddok may be reduced to 0.8 - 1.0 L/ac. Assist oil concentrate at 1.0 L/100 L of spray volume should be added for all applications of Laddok.

   Water volume: 80 - 160 L/ac.

   Pressure: 275 - 400 kPa.

   Nozzles: Flat fan or cone type only recommended.

8. **Application Tips:** Best results if weeds are young and actively growing. Do not apply where runoff erosion is likely to occur. Do not apply if crop is under stress from prolonged cold weather, poor fertility or when crop is wet and succulent from recent rainfall as crop injury may occur. It is important to obtain complete spray coverage of all leaves for best control.

9. **How it Works:** Both bentazon and atrazine are contact herbicides interfering with photosynthesis.

10. **Expected Results:**

    Weeds: Turn yellow, then brown, usually within 2 weeks.

    Crops: Occasionally show light leaf speckling. Poor results may occur if weeds are too mature, if spray fails to penetrate crop canopy or under conditions of prolonged cool weather or drought.

11. **Effects of Rainfall:** Within 6 - 8 hours may reduce activity.

12. **Movement in Soil:** Very little, except in sandy soil and with excessive moisture.

13. **Cropping Restrictions:**

    Succeeding crops: On very light soils with low organic matter, some atrazine may carryover and injure susceptible crops. Injury may also occur if land treated with Laddok is planted to any crop other than corn in the same season.

    Grazing restrictions: Treated plants can be used for silage.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 3,000 mg/kg. Intake may cause convulsions and coma.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a cool, dry place above 0°C.

17. **Resistance Management:** Laddok is both a Group 5 and a Group 6 herbicide. Any weed population may contain or develop plants naturally resistant to Laddok and other Group 5 and 6 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Liberty 150 SN *(glufosinate ammonium)*

Group 10

Manufacturer: **Bayer CropScience**

CAUTION POISON

1. **Formulations:** Liquid: 150g/L; 13.5 L jug.

2. **Registered Mixes:** Poast Ultra, Select.

3. **Crops:** Canola varieties tolerant to Liberty. These varieties will be labelled with Liberty Link symbol.

    Desiccation only: Alfalfa (grown for seed), lentils, potatoes.

4. **Weeds Controlled:**

    barnyard grass
    cleavers
    common chickweed
    cow cockle
    dandelion
    flixweed
    green foxtail
    hemp-nettle
    lady's-thumb
    lamb's-quarters
    perennial sow-thistle
    redroot pigweed
    round-leaved mallow
    scentless chamomile
    smartweed
    stinkweed
    stork's-bill
    volunteer canola
    volunteer flax
    volunteer wheat
    wild buckwheat
    wild mustard
    wild oats

5. **Weeds Suppressed:** Canada thistle, quackgrass, volunteer barley.

6. **When Used: Crop stage:** Liberty Link Canola: cotyledon stage up to the early bolting stage of canola. Slight discolouration of the canola may be visible after application. This effect is temporary and will not influence crop growth, maturity or yield.

    Desiccation: Alfailfa: Apply Liberty at 50 - 75% pod turn (brown) stage. Do NOT apply more than once per year.

    Lentils: Apply Liberty at 40 - 60% pod turn (yellow to brown) stage. Do NOT apply to lentils grown for seed (sufficient data are not available to support such use).

    Potatoes: Apply Liberty approximately 14 - 21 days to expected harvest. Do NOT apply to potatoes grown for seed stock.

Liberty 150 SN (cont'd)

7. How to Apply:

With: Ground equipment and by air.

Rate: Best control will be obtained when Liberty is applied in the recommended leaf stages of Liberty Link canola.

Apply Liberty at 810 mL/ac

Weed	Leaf stage	Weed	Leaf stage
barnyard grass	1 - 4 leaves	Russian thistle	up to 8 cm
cow cockle	1 - 4 leaves	smartweed	1 - 6 leaves
green foxtail*	1 - 6 leaves (maximum 3 tillers)	stinkweed	1 - 8 leaves
lady's-thumb	1 - 6 leaves	volunteer canola	1 - 4 leaves
lamb's-quarters	1 - 6 leaves	volunteer flax	up to 6 cm
		wild mustard	1 - 5 leaves

* Fields with only green foxtail: 538 mL/ac.

Apply Liberty at 1.08 L/ac

Weed	Leaf stage	Weed	Leaf stage
Canada thistle (top growth suppression only)**	10 cm height	redroot pigweed	1 - 4 leaves
common chickweed	1 - 4 leaf pairs	round-leaved mallow	1 - 4 leaves
hemp-nettle	1 - 3 leaf pairs	scentless chamomile	up to 10 cm
kochia	up to 8 cm	shepherd's-purse	1 - 6 leaves
perennial sow-thistle	1 - 8 leaves	volunteer barley** (suppression only)	1 - 4 leaves (maximum 2 tillers)
quackgrass (top growth suppression only)	1 - 4 leaves	volunteer wheat**	1 - 4 leaves (maximum 2 tillers)
		wild buckwheat**	1 - 3 leaves

** Use 1.35 L/ac for heavy populations. For control of volunteer barley, add Venture at 40 - 80 g/ac with recommended adjuvant. For control of volunteer barley and wild oats, add Select at 26 mL/ac plus adjuvant recommended on the Select label. For improved volunteer barley control, add Poast Ultra at 95 mL/ac plus Merge at 200 mL/ac using 45 L/ac water volume.

Apply Liberty at 1.35 L/ac

Weed	Leaf stage	Weed	Leaf stage
cleavers	1 - 2 whorls	quackgrass (season-long control)	1 - 4 leaves
dandelion	1 - 15 cm rosette	stork's-bill	1 - 3 leaves
flixweed	1 - 10 cm	wild oats	1 - 4 leaves (maximum 2 tillers)
hemp-nettle	1 - 4 leaf pairs		

For control of volunteer barley and enhanced control of wild oats, add Select at 26 mL/ac plus adjuvant recommended on Select label.

Apply Liberty at 1.62 L/ac

Weed	Leaf stage
Canada thistle (better top growth suppression)	10 cm height
quackgrass (season-long control for heavy populations)	1 - 4 leaves

Rate:

Desiccation use	
Alfalfa	Apply Liberty at 1.08 L/ac
Lentils	Apply Liberty at 810 mL/ac - 1.08 L/ac (use the higher rate when the canopy is dense and/or there are higher populations of weeds present at application
Potatoes	Apply Liberty at 1.21 L/ac

Second application: A second application of Liberty can be made to fields treated initially if new weed germination or growth is present. Apply when the new weed growth is in the correct leaf stage and up to the early bolting stage of canola growth. Apply at a rate of 0.8 - 1.35 L/ac in the second application.

Water volume: Ground: Minumum of 45 L/ac of water. Air: Minimum of 22 L/ac of water, when used post-emergent in Glufosinate tolerant canola. Apply Liberty in a minimum of 13 - 22 L/ac of water when used for desiccation.

Pressure: 275 kPa (310 kPa if check valves used).

Nozzles: Only 110° or 80° flat fan recommended for optimum spray coverage and canopy penetration. Application of the spray at a 45° angle forward will result in better spray coverage. **Do not use flood jet nozzles, controlled droplet application equipment or air-assisted spray equipment. Uniform, thorough spray coverage is important to achieve consistent weed control.**

Mixing instructions:

Liberty:

1. Fill tank within one-half the amount of clean water.
2. Add the correct amount of Liberty.
3. Add the remaining amount of water, begin agitation and spray out immediately.

Liberty and Select: Liberty Link canola only. When tank mixing Liberty and Select, always add Amigo adjuvant to the tank first, then add Liberty to the tank followed by Select.

1. Thoroughly clean the sprayer by flushing the system with water containing detergent.
2. Fill clean spray tank half full with clean water. Start agitation system.
3. Add the required amount of Amigo adjuvant to the tank. Continue to agitate until thoroughly mixed.
4. **Stop** agitation. Add the correct amount of Liberty to the spray tank. Start agitation system.
5. Add the correct amount of Select along with the remaining amount of water necessary to fill the spray tank.
6. Continue to agitate or run the by-pass system and spray out immediately.
7. After any break in the spraying operation, agitate thoroughly before spraying again. Check inside the tank to ensure that sprayer agitation is sufficient to remix the spray materials. Do not allow the mixture to sit overnight.
8. If an oil film starts to build-up in the tank, drain it and clean tank with strong detergent solution.
9. Immediately after use, thoroughly clean the sprayer by flushing the system with clean water containing detergent.

Note: Ensure that all circuits (pipes, booms, etc.) have the correct Liberty/water concentration before application is started.

Note: The addition of an anti-foaming agent may reduce foaming, especially when using soft water.

Sprayer cleanup: Before and after using Liberty, always complete a thorough cleaning of the spray tank, lines and filter. Spray equipment should be thoroughly rinsed using a strong detergent solution.

8. **Application Tips:** For best results, apply to emerged, young actively growing weeds. Weeds that emerge after application will not be controlled. Liberty will have an effect on weeds larger than the recommended leaf stage; however, speed of activity and control may be reduced.

Liberty 150 SN (cont'd)

9. **How it Works:** Liberty works primarily as a contact herbicide. Thorough coverage of the weeds to be controlled is essential. Absorbed by all leaf and stem surfaces. Interferes with plants' ability to detoxify ammonia. The speed of action of Liberty is influenced by environmental factors. At cool temperatures (below 10°C), poor moisture and low humidity, speed of action may be reduced.
10. **Expected Results:** Generally, visual symptoms appear 2 - 4 days after application. When a rate range is given, the higher rate should be used:
    1. When weed or crop growth is dense.
    2. When the weeds are large and/or mature – i.e. advanced leaf stages and plant height.
    3. When environmental conditions are cool and dry.
11. **Effects of Rainfall:** If rainfall occurs within 4 hours of application, effectiveness may be reduced.
12. **Movement in Soil:** Liberty breaks down rapidly in the soil, which will effectively limit soil movement.
13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze the treated crop or cut for hay; sufficient data are not available to support such use. There are no cropping or rotational restrictions after application.
14. **Toxicity:** Acute oral LD_{50} (male rats) = 2,270 mg/kg; female rats = 1,730 mg/kg. Moderate dermal irritant. No allergic potential.
15. **Precautions, First Aid:** Keep out of reach of children and animals. This product may cause eye irritation. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. If **swallowed**, seek medical attention. Workers should not enter treated canola fields within 24 hours of treatment. Workers who must enter field within this time period should wear long sleeved shirt, long pants and chemical resistant gloves.
16. **Storage:** Do not store below freezing. If stored for one year or longer, shake well before using.
17. **Resistance Management:** Liberty 150 SN is a Group 10 herbicide. Any weed population may contain or develop plants naturally resistant to Liberty 150 SN and other Group 10 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Lontrel *(clopyralid)*

Group 4

Manufacturer: **Dow AgroSciences Canada Inc.**

CAUTION POISON

1. **Formulations:** Solution; 360 g/L; 4.45 L jug.
2. **Registered Mixes: Canola**: Hoe-Grass 284, Poast Ultra; **Flax**: MCPA (Amine or Ester), Poast Ultra, Poast Ultra + MCPA (Amine), Fusion, Select; **Oats**: MCPA (Amine or Ester); **Wheat and barley:** 2,4-D or MCPA (Amine or Ester), Refine Extra + MCPA Ester 500, Refine Extra + 2,4-D Ester 600. **CLEARFIELD Canola:** Odyssey; **Wheat** (spring only, not durum): Triumph Plus; Glyphosate Tolerant Canola: Roundup Original/Transorb, Vantage and Vantage Plus.

    Mixing restrictions: Add 1/2 amount of water to tank, add Lontrel, add more water, add other herbicide, then add remaining amount of water. **Mix order with Refine Extra or Odyssey:** Add Refine Extra or Odyssey herbicide, then Lontrel, then other herbicides, surfactant last.

3. Crops:

- altari wild ryegrass
- barley
- cabbage
- canola
- creeping red fescue
- crested wheat grass
- flax
- intermediate wheat grass
- Kentucky bluegrass
- meadow fescue
- meadow foxtail
- non-crop farmland
- oats
- orchard grass
- reed canary grass
- Russian wild ryegrass
- slender wheat grass
- smooth bromegrass
- sugar beets
- summerfallow
- tall fescue
- tall wheat grass*
- timothy
- wheat

* Forage production only.

Underseeding: Not recommended for forage legumes.

4. Weeds Controlled: Alsike clover, Canada thistle (7.2), common groundsel, golden rod, perennial sow-thistle (7.0) (top growth control), scentless chamomile, tufted vetch, volunteer alfalfa, wild buckwheat (6.5).

5. Weeds Suppressed: Canada thistle (top control only at 170 mL/ac rate), ox-eye daisy, sorrel.

6. When Used:

Crop stage: Canola: 2 - 6 leaf stage. **Flax:** 5 - 10 cm high. **Forage grasses:** Seedling: 2 - 4 leaf stage. Established: Shot blade or in fall after harvest or early spring. **Sugar beets:** Cotyledon to 8 leaf stage. **Wheat, barley and oats:** 3 leaf to flag leaf stages. When tank mixed with 2,4-D or MCPA, observe timing on their respective labels.

Weed stage: Canada thistle: rossette to prebud stage and actively growing; other susceptiable weeds at appropriate seedling stage and actively growing.

7. How to Apply:

With: Ground equipment.

Rate:

Crop	Rate	Weeds controlled
Barley, oats, wheat	113 mL/ac + MCPA or 2,4-D Amine or Ester	Canada thistle (top growth; 6 - 8 weeks) + MCPA or 2,4-D susceptible weeds.
	170 mL/ac + MCPA or 2,4-D Amine or Ester	Canada thistle (season-long control) + MCPA or 2,4-D susceptible weeds.
	85 mL/ac + 8 g/ac Refine Extra + 340 mL/ac MCPA Ester 500** or 85 mL/ac + 8 g/ac Refine Extra + 283 mL/ac 2,4-D Ester 600**	Lady's-thumb, perennial sow-thistle (top growth control), stinkweed, volunteer canola, wild buckwheat, wild mustard. Seasonal control of Canada thistle and suppression of cleavers. **Note:** Refer to MCPA or 2,4-D Ester labels for additional weeds.
	170 mL/ac	Canada thistle (top growth; 6 - 8 weeks).
	227 mL/ac	Canada thistle (season-long control).

* Do not apply 2,4-D on oats due to probability of crop injury.

** Do not use these tank mixes on oats. Mix order: Refine Extra, then Lontrel, then MCPA or 2,4-D, then surfactant.
When tank mixing with 2,4-D or MCPA, refer to rate and weeds controlled on respective labels.

Cabbage	202 mL/ac in 120 L/ac water volume	

(continued)

Lontrel (cont'd)

(continued)

Crop	Rate	Weeds controlled
Canola (seedling and established), grasses, non-crop farmland and summerfallow*	170 mL/ac 227 mL/ac 336 mL/ac	Canada thistle (top growth control) for 6 - 8 weeks. Canada thistle (season-long control), common groundsel, perennial sow-thistle (top growth control), scentless chamomile, wild buckwheat. Canada thistle (season-long control and suppression into following season), common groundsel, perennial sow-thistle (top growth control), scentless chamomile, wild buckwheat.
* On non-crop farmland and summerfallow, 336 mL/ac rate only.		
CLEARFIELD canola	170 mL/ac + Odyssey 227 mL/ac + Odyssey	Canada thistle top growth (6 - 8 weeks). Canada thistle (season-long control). **Note:** See Odyssey label for other weeds controlled.
Glyphosate tolerant canola	113 mL/ac + 506 mL/ac Roundup Original, Transorb, Vantage or Vantage Plus	Season-long top growth control of Canada thistle, dandelions and perennial sowthistle <15 cm. Control of wild buckwheat. Suppression of dandelion >15 cm. **Note:** See Roundup Original, Roundup Transorb, Vantage/Vantage Plus labels for other weeds controlled.
Flax	170 mL/ac + MCPA Amine or Ester 227 mL/ac 336 mL/ac	Canada thistle (top growth control) + MCPA susceptible weeds. Canada thistle (season-long control), common groundsel, perennial sow-thistle (top growth control), scentless chamomile, wild buckwheat. Canada thistle (season-long control and suppression into the following year), common groundsel, perennial sow-thistle (top growth control), scentless chamomile, wild buckwheat.
Sugar beets	227 - 336 mL/ac	Canada thistle.
Renovation one application per year	336 mL/ac	Canada thistle (season-long and suppression into the following year), ox-eye daisy, sheep sorrel, tufted vetch.

Water volume: 40 - 80 L/ac.

Pressure: 200 - 275 kPa.

Nozzles: Flat fan nozzles preferred.

8. **Application Tips:** Do not use products containing 2,4-D on oats due to probability of crop injury. Rates of MCPA Ester of 170 g active ingredients/ac or higher, or MCPA Amine of 200 g active ingredient/ac may cause some delay in maturity of flax resulting in yield reduction. Make sure the sprayer tank has been thoroughly cleaned before Lontrel is mixed. Treat crops during warm weather when weeds are actively growing. Best results are obtained when Canada thistle is actively growing and soil moisture is adequate for rapid growth. Under cool or dry conditions, control of Canada thistle may be severely reduced. sow-thistle plants emerging after spraying will not be controlled. Where contact herbicides are used, such as bromoxymil, that damage the leaves of the Canada thistle, apply Lontrel 14 days prior or after an interval of 14 days, which allows Canada thistle to recover and resume growth.

Forage grasses: For control of the weeds listed on the label plus alsike clover, apply Lontrel at the rate of 170 - 336 mL/ac in 45 - 90 L/ac of water. Make one application per season by ground sprayer. For seedling grasses, apply at the 3 leaf stage and beyond. For established grasses, apply in the fall after harvest or early spring.

9. **How it Works:** Clopyralid is a systemic, hormone-type herbicide. It is absorbed by leaf and stem surfaces and is readily translocated. Maximum efficacy results from foliar application to young actively growing plants.
10. **Expected Results:** Herbicide symptoms on affected plants include swollen growing points and roots, cupping of leaves, twisted and distorted stems and leaves. Plants will gradually stop growing and change colour, first to dark green and then to yellow before turning brown as they die. Maximum effectiveness results from foliar applications to young actively growing plants. Death of weeds may not occur until 14 - 21 days after application. With the lowest rate of Lontrel on Canada thistle, some regrowth may occur by the end of the season, but this will not interfere with harvesting of the crop.
11. **Effects of Rainfall:** A rain-free period of 4 - 6 hours is required.
12. **Movement in Soil:** Clopyralid is somewhat soluble in water but is generally not mobile in soil under typical prairie conditions.
13. **Cropping Restrictions:**

    Drift: Small amounts of drift may damage sensitive plants such as legumes.

    Succeeding crops: Fields treated with Lontrel can be seeded to barley, canola, forage grasses, flax, mustard, oats, rye, wheat or summerfallowed. Do not seed to crops other than those listed above for at least one year after treatment.

    Use of straw and manure from treated crops: Lontrel residues in straw may be harmful to susceptible plants. Do not use straw from treated crops for composting or mulching on susceptible broadleaf crops. Manure can be spread on fields that will be seeded to barley, flax, oats, canola (rapeseed), rye or wheat. Do not grow susceptible crops such as peas, beans, lentils, potatoes, sunflowers or other sensitive crops on land that has been mulched with straw containing Lontrel 360 residues within the last 12 months.

    Grazing restrictions: Crops or areas treated with this product may be grazed immediately following treatment. Sugar beets – Do not apply within 90 days of harvest. Strawberry – P.H.I. = 200 days.

    Other restrictions: Sugar beet pre-harvest interval is 90 days. Strawberry pre-harvest interval is 200 days.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LC_{50} (rats) = >2,000 mg/kg. Acute oral LD_{50} (bees) = >100 µg/bee. Extremely low toxicity to fish.
15. **Precautions, First Aid: Flammable.** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. If **swallowed**, seek medical attention.
16. **Storage:** Store away from food, feedstuffs, fertilizer, seeds, insecticides, fungicides or other pesticides. Store in heated storage away from open flames or sparks. If frozen, warm slowly to room temperature and mix thoroughly before use.
17. **Resistance Management:** Lontrel is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Lontrel and other Group 10 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Lorox/Linuron 480 *(linuron)*

Group 7

Manufacturer: **DuPont Canada Inc./United Agri Products**

1. **Formulations:** Dry flowable; Lorox DF; 50%; 5.0, 10.0 kg jug; Dry Flowable, Toss-N-Go water soluble pouches, 50%, 2.0, 2.5 kg bag. Linuron 480, 480 g/L, 10L jug.
2. **Registered Mixes:** Estemine MCPA, MCPA Amine 500 (barley, oats, spring wheat); MCPA K-salt (barley, spring wheat); Target (refer to Target label for application rates) (barley, durum wheat, spring wheat).

Mix instructions:

1. Fill tank with 1/4 required amount of water.
2. Turn on full agitation.
3. Add the required number of Lorox DF Toss-N-Go pouches. Maintain full agitation until pouches are completely dissolved and product is fully dispersed.
4. Continue filling tank with water and add tank mix partners (if applicable) in the following sequence:
   - dry formulations,
   - liquid formulations,
   - emulsifiable concentrates and surfactants.
5. Continue with full agitation.
6. On repeat tank loads, ensure that the amount of spray solution left in the tank from the previous load is less than 10% of the volume to be mixed.

3. Crops:

Lorox/Linuron 480

apple
asparagus (8.7)
carrots (8.2)
cherry
established fruit trees*
established shelterbelts**
field corn (6.5)
pear
plum
potatoes (8.7)

Lorox/Linuron 480 + MCPA Amine 500 (on cereals, do not use Lorox/Linuron alone)

barley (8.6)
durum wheat (8.2)
oats (8.9)
Saskatoon berry
spring wheat (8.2)

Lorox DF

carrots (8.2)
potatoes (8.7)
soybeans

established – stock established at least 1 year.

* Apple, cherry, pear, plum.

** American elm, caragana, Colorado spruce, green ash, Manitoba maple, poplar, Scotch pine, Siberian elm, white spruce, willow.

4. Weeds Controlled:

Lorox/Linuron 480 (in crops other than cereals greater than 400 g/ac)

annual sow-thistle
barnyard grass (8.3)
common chickweed (9.0)
goosefoot (8.4)
knotweed
lamb's-quarters (7.9)
purslane (8.4)
ragweed
redroot pigweed (7.9)
shepherd's-purse
smartweeds (9.0)
stinkweed (8.5)
wild buckwheat (8.5)
wormseed mustard (8.9)

Lorox/Linuron 480 + MCPA Amine 500 (in cereals 210 g/ac)

common chickweed (7.4)
corn spurry
cow cockle (6.8)
flixweed
hemp-nettle (7.5)
lamb's-quarters (8.9)
ragweed
redroot pigweed (7.8)
shepherd's-purse
smartweeds (7.0)
stinkweed (8.9)
stork's-bill
tartary buckwheat (7.9)
wild buckwheat (7.5)

Underseeding: Forages not recommended.

5. Weeds Suppressed:

Lorox/Linuron 480: Green foxtail (6.7), yellow foxtail.

Lorox/Linuron 480 + MCPA: Canada thistle (4.7), green foxtail, yellow foxtail.

6. When Used:

Crop stage:

Asparagus: Immediately after discing, before crop emergence; may be repeated after last cutting.

Carrots: Pre-emergent; after planting (at least 1 cm deep) but before crop emergence. Post-emergent; 2 or more fully developed true leaves (8 - 15 cm tall). Before annual grasses 5 cm tall, broadleaf weeds 15 cm tall. Pre- + post-emergent; observe limitations of pre- and post-emergent treatments. To prevent crop injury, treatments must be at least 2 weeks apart.

Cereals: 2 - 4 leaf. Must be tank mixed with MCPA Amine when applying on wheat, oats and barley or MCPA K-salt when applying to wheat and barley. **Do not use Lorox/Linuron 480 alone on cereals.**

Corn: Lorox L; post-emergent, after corn is at least 38 cm tall, directed spray. Atrazine 80W mix; pre-emergent, after planting at least 5 cm deep but before crop emergence. Do not spray over top of corn.

Potatoes: Pre-emergent; after planting (at least 5 cm deep) but before crop emergence. Before grassy weeds 5 cm tall, broadleaf weeds 15 cm tall. Treat after final hilling operation.

Chemical fallow: Sweep + MCPA mix; when broadleaf weeds small and actively growing, annual grasses 2 - 4 leaf. Only one application per season. Apply only in spring.

Fruit trees (established at least 10 years, peach 1 year): Directed spray under trees and bushes before buds open and before weeds 10 cm tall.

Shelterbelts (established): Stock planted for at least 1 year; directed spray **under trees** and bushes before buds open in spring, before weeds 10 cm tall.

Weed stage: Annual broadleaf weeds – 2 to 4 leaf stage; green foxtail: 1 - 3 leaf stage.

7. How to Apply:

With: Aircraft or ground equipment.

Rate:

Crop	Time (crop)	Lorox/Linuron 480 (L/ac)	Tank mix
Asparagus	Pre-emergent	1.4 - 1.8	NA*
Barley, oats, spring wheat	2 - 4 leaf	0.17 - 0.22	MCPA Amine 500; 345 - 445 mL/ac
Barley, spring wheat	2 - 4 leaf	0.17 - 0.22	MCPA K-salt; 405 - 567 mL/ac
Carrots	Pre-emergent	0.45 - 1.37	NA
	Post-emergent	0.91 - 1.82	NA
	Pre + post-emergent	0.45 - 0.91; 0.91 - 1.82	NA
Corn (2% or less soil O.M.)	Pre-emergent	0.91	Atrazine 80W; 610 g/ac
(2 - 5% soil O.M.)	Pre-emergent	1.3	Atrazine 80W; 910 g/ac
	Post-emergent	0.97 - 1.82	Oil – water emulsion
Fruit trees	Spring	3.6	Surfactant
Potatoes	Pre-emergent	0.91 - 1.82	NA
Shelterbelts (established)	Spring	1.82	NA

* NA – Not Applicable.

Crop	Time (crop)	Lorox DF (kg/ac)	Tank mix
Barley, oats, spring wheat	Post-emergent	0.16 - 0.21	MCPA Amine 500; 345 - 445 mL/ac
Barley, spring wheat	Post-emergent	0.16 - 0.21	MCPA K-salt; 405 - 567 mL/ac
Carrots	Pre-emergent	0.4 - 1.3	
	Post-emergent	0.9 - 1.8	
	Pre + post-emergent	0.4 - 0.9; 0.9 - 1.8	
Potatoes	Pre-emergent	0.9 - 1.8 kg/ac	

Lorox/Linuron 480 (cont'd)

Water volume: Asparagus, potatoes: 120 L/ac. Carrots: 90 - 135 L/ac. Cereals: 40 L/ac minimum. Corn: pre-emergent 90 - 135 L/ac; post-emergent 70 - 140 L/ac. Fruit trees: 160 - 240 L/ac.

Pressure: 275 kPa.

Nozzles: Flat fan recommended. 50 mesh line strainers and screens.

Incorporation: Not applicable.

Must be tank mixed with MCPA Amine when applying to wheat, oats and barley or MCPA K-salt when applying to wheat and barley.

8. **Application Tips: Do not use on sandy or coarse-textured soils, low in organic matter, as crop injury may result.** Do not use when crops are under drought stress. Fruit trees: avoid contact with fruit, foliage and green bark with spray or drift as injury may result.
9. **How it Works:** A systemic herbicide absorbed by leaves and roots. Yellowing (chlorosis), stunting and finally death occurs 10 - 14 days after treatment.
10. **Expected Results:**

    Weeds: Yellowing starts 7 - 10 days after application. Effect greatest under excellent growing conditions. Weed control will vary depending on species, time of application and growing conditions.

    Crop: A slight yellowing of crop, leaf tip and leaf margin burn may be seen 7 - 10 days after application. Crop recovers within 14 - 18 days. Crop injury can occur if applied during period of high heat.
11. **Effects of Rainfall:** Heavy rainfall within 2 hours may decrease activity. Pre-emergent treatment requires rainfall or irrigation for activation. Carrots, corn or potatoes may be severely injured if unusually heavy rains follow application.
12. **Movement in Soil:** Movement by leaching is least in soils high in clay and/or organic matter; greatest in sand.
13. **Cropping Restrictions:** Do not apply post-emergent corn treatment within 60 days of harvest. 25% carryover into next growing season if rates are 1.8 L/ac or higher.

    Grazing restrictions: Do not graze or cut for hay; there are not sufficient data available to support such use.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 4,000 mg/kg. Very toxic to fish. Non-toxic to bees.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Lorox/Linuron 480: Store in a heated area. Do not freeze as settling may occur. If frozen, thoroughly mix to resuspend. Lorox DF: Store in a dry place.

    Note: Similar product is Afolan F.
17. **Resistance Management:** Lorox/Linuron 480 is a Group 7 herbicide. Any weed population may contain or develop plants naturally resistant to Lorox/Linuron 480 and other Group 7 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

MCPA *(Amine, Ester, K and Na-salts)*

Group 4

Manufacturer: Numerous Manufacturers

WARNING POISON

1. Formulations:

Liquid: MCPA Amine (500, 80), Estemine MCPA; 500 g/L; 2 x 10 L jugs. MCPA Potassium (K) salt: MCPA K-salt; 400 g/L.

Emulsifiable concentrate: MCPA Ester (500, 80); 500 g/L.

Solution: Sodium (Na) salt: MCPA Na-salt 300 g/L. 2 x 10 L, 20 L containers.

Solventless Ester: SEE MCPA.

2. Registered Mixes: **Tank mix crops in brackets. Check the labels.**

MCPA Amine: Afolan F (barley, oats, wheat); Banvel (barley, canary seed, oats, spring rye, wheat), Buctril M (barley, oats, wheat); Hoe-Grass II (barley: **not** Betzes or Klages, spring rye, triticale, wheat); Lorox L (barley, oats, wheat); NaTA (barley, flax, oats, peas); Sencor (wheat); Sweep (chemical fallow); Pardner (barley, oats, wheat).

MCPA Ester: Avenge (barley, canary seed, Avenge wheat varieties); Avenge + Pardner (barley, Avenge wheat varieties); [Buctril M, Hoe-Grass II (see Amine)]; Stampede 360 (wheat); [Sweep, Pardner (see Amine)], Poast Ultra (flax).

MCPA K-salt: Banvel, Buctril M, Lorox L, Pardner.

MCPA Na-salt: Buctril M.

Note: Some formulations can be mixed with liquid fertilizers (28-0-0).

Mixing restrictions: Ensure that the proper formulation of MCPA, **rate** and order of mixing are used when tank mixing.

3. Crops:

MCPA Amine

asparagus
barley (8.7)
corn
durum wheat
fall rye
field peas (7.8)
flax (8.0)
grasses (estab.)
hard red spring wheat (8.7)
non-crop areas
oats (9.0)
pasture grass (estab.)
processing peas
rangeland
red clover (seedling, estab.)
spring rye
turf (estab.)
winter wheat (8.9)

MCPA Ester

asparagus
barley (8.0)
durum wheat
fall rye
flax
grasses (estab.)
hard red spring wheat (8.7)
non-crop areas
oats (9.0)
pasture grass (estab.)
rangeland
spring rye
winter wheat (8.9)

Underseeding: Do **not** use on crops underseeded to legumes.

MCPA K-salt

barley
corn
durum wheat
fall rye
flax
hard red spring wheat
oats
spring rye
winter wheat

MCPA Na-salt

barley
corn
durum wheat
fall rye
field peas (7.8)
flax
hard red spring wheat
non-crop areas
oats
pasture grass (estab.)
processing peas
spring rye
turf (estab.)
winter wheat

(estab.) = established

MCPA (cont'd)

4. Weeds Controlled:

MCPA Amine – *Group I*

ball mustard
burdock
cocklebur
common ragweed
false ragweed
flixweed (7.1)
giant ragweed
hare's-ear mustard
Indian mustard
kochia
lamb's-quarters (7.2)
prickly lettuce
Russian pigweed
shepherd's-purse
stinkweed (7.5)
sweet clover
thyme-leaved spurge
tumble mustard
vetch
wild mustard (8.5)
wild radish
wild sunflower
wormseed mustard

Group II

American dragonhead
bluebur
common peppergrass
dog mustard
field peppergrass
hairy galinsoga
oak-leaved goosefoot
pineappleweed
purslane
redroot pigweed (6.5)
tall buttercup
tansy mustard
tumble pigweed

MCPA Ester – *Group I*

ball mustard
burdock
cocklebur
common ragweed
false ragweed
flixweed
giant ragweed
hare's-ear mustard
Indian mustard
kochia
lamb's-quarters (8.4)
prickly lettuce
Russian pigweed
shepherd's-purse
stinkweed (8.3)
sweet clover
tumble mustard
vetch
wild mustard (5.7)
wild radish
wild sunflower
wormseed mustard

Group II

bluebur
common peppergrass
dog mustard
field peppergrass
hairy galinsoga
oak-leaved goosefoot
purslane
tansy mustard

MCPA K-salt – *Group I*

ball mustard
bluebur
burdock
cocklebur
common ragweed
false ragweed
flixweed
giant ragweed
hare's-ear mustard
Indian mustard
kochia
lamb's-quarters (8.5)
prickly lettuce
Russian pigweed
shepherd's-purse
stinkweed (8.3)
tumble mustard
wild mustard
wild radish
wild sunflower
wormseed mustard

Group II

annual smartweed
annual sow-thistle
biennal wormwood
curled dock
dandelion
dog mustard
field peppergrass
goat's-beard
prostrate pigweed
purslane
redroot pigweed
tansy mustard

MCPA Na-salt – *Group I*

ball mustard
burdock
cocklebur
common ragweed
false ragweed
flixweed
giant ragweed
hare's-ear mustard
Indian mustard
lamb's-quarters (8.5)
prickly lettuce
Russian pigweed
shepherd's-purse
stinkweed (8.3)
tumble mustard
wild mustard
wild radish
wild sunflower
wormseed mustard

Group II

annual smartweed
bluebur
curled dock
dog mustard
goat's-beard
hairy galinsoga
peppergrass
purslane
redroot pigweed
spear-leaved goosefoot
tall buttercup
tansy mustard

5. Weeds Suppressed: (includes top growth control)

MCPA Amine – *Group I*

field horsetail
common plantain

Group II

annual smartweed (4.3)
annual sow-thistle
biennial wormwood
blue lettuce
Canada thistle (5.8)
curled dock
dandelion
field bindweed
goat's-beard
gumweed
hedge blindweed
hemp-nettle (4.2)
hoary cress
leafy spurge
perennial sow-thistle
tartary buckwheat
wild buckwheat (3.6)

MCPA Ester – *Group I*

field horsetail
common plantain

Group II

annual smartweeds
annual sow-thistle
biennial wormwood
blue lettuce
Canada thistle (4.5)
curled dock
dandelion
field bindweed
goat's-beard
gumweed
hedge bindweed
hemp-nettle (5.8)
hoary cress
leafy spurge
perennial sow-thistles
redroot pigweed (4.4)
tartary buckwheat (4.3)
wild buckwheat (4.7)

MCPA K-salt – *Group I*

field horsetail
vetch

Group II

blue lettuce
Canada thistle
field bindweed
goosefoot
gumweed
hedge bindweed
hemp-nettle
hoary cress
leafy spurge
perennial sow-thistle
tartary buckwheat
wild buckwheat

MCPA Na-salt – *Group I*

field horsetail

Group II

annual sow-thistle
biennial wormwood
blue lettuce
Canada thistle
field bindweed
goosefoot
gumweed
hedge bindweed
hemp-nettle
hoary cress
leafy spurge
perennial sow-thistle
Russian knapweed
tartary buckwheat
wild buckwheat

6. When Used:

Crop	MCPA Amine	MCPA Ester	MCPA K-Salt	MCPA Na Salt
Asparagus	After cultivation just before spears appear. May repeat at end of cutting season.	After cultivation just before spears appear. May repeat at end of cutting season.	–	–
Barley, rye, spring wheat	3 leaf expanded to early flag leaf; milk stage to full maturity.	3 leaf expanded to early flag leaf; milk stage to full maturity.	3 leaf expanded to early flag leaf.	3 leaf expanded to early flag leaf.
Corn	Before 15 cm tall; after 15 cm, directed spray.	–	Before 15 cm tall; after 15 cm, directed spray.	Before 15 cm tall; after 15 cm, directed spray.
Fall rye, winter wheat	Before flag leaf in spring.	Before flag leaf in spring.	Before flag leaf in spring.	Before flag leaf in spring.
Field peas, processing peas	2 - 5 nodes.	–	–	2 - 5 nodes.
Flax	5 cm to early pre-bud.	5 cm to early pre-bud.	5 cm to early pre-bud.	5 cm to early pre-bud.
Oats	Up to flag leaf.	Up to flag leaf.	2 - 6 leaves.	Up to flag leaf.

(continued)

MCPA (cont'd)

(continued)

Crop	MCPA Amine	MCPA Ester	MCPA K-Salt	MCPA Na Salt
Red clover (for seed) (estab.)	Breaking of dormancy in spring up to 7.5 cm.	–	–	–
Seedling red clover for forage	1 - 3 trifoliate in year of establishment.	–	–	–
Seedling red clover for seed	1 - 3 trifoliate stage.	–	–	–

(estab.) = established

7. How to Apply:

With: Aircraft or ground equipment.

Rate: MCPA alone. MCPA rate for tank mixes may be different.

Crop	MCPA Amine	MCPA Ester	MCPA K-salt	MCPA Na-salt
Asparagus	1.4 L/ac	1.4 L/ac	NRF*	NRF
Barley, oats, rye, wheat (not underseeded)				
(Group I weeds)	280 - 445 mL/ac	280 - 445 mL/ac	375 - 505 mL/ac	485 - 710 mL/ac
(Group II weeds)	505 - 710 mL/ac	505 - 710 mL/ac	610 - 810 mL/ac	810 - 1200 mL/ac
Corn	Up to 445 mL/ac	NRF	505 mL/ac	Up to 705 mL/ac
Flax	Up to 445 mL/ac	Up to 445 mL/ac	605 - 850 mL/ac	Up to 705 mL/ac
Non-crop areas	1.0 - 2.0 L/ac	1.6 L/ac	NRF	Up to 2.85 L/ac
Pasture, rangeland, turf	1.1 - 1.7 L/ac	0.6 - 1.1 L/ac	NRF	Up to 2.85 L/ac
Peas	135 - 220 mL/ac	NRF	NRF	380 - 505 mL/ac
Red clover (seedling & estab.)	225 mL/ac	–	–	–

* NRF – No Recommendation Found.

Rate: MCPA used in tank mixes, if different from MCPA rate alone. Check the labels before you mix.

Tank mix	MCPA Amine	MCPA Ester	MCPA K-salt	MCPA Na-salt
Buctril M	223 mL/ac	223 mL/ac	278 mL/ac	NR
Hoe-Grass II	28 mL/ac	28 mL/ac	NR	NR

* NR – Not Recommended.

Water volume: Aircraft: 12 L/ac minimum. Ground: 40 L/ac.

Peas: 70 L/ac minimum (Amine), 60 L/ac minimum (Na-salt).

Pasture, rangeland, turf: 180 L/ac.

Pressure: Air: 235 kPa or less; Ground: 200 - 275 kPa.

Nozzles: Flat fan recommended.

8. **Application Tips:** **Recommendations vary from label to label, read label of product used.** Do not spray when air temperature is above 27°C. Extremely hard water may reduce performance or cause problems in spraying the product. Do not use on bentgrasses. Always use recommended volume of water when applying on peas to avoid crop damage.
9. **How it Works:** A systemic, absorbed by leaf and stem surfaces and translocated to the actively growing regions. MCPA disrupts cell division, causing abnormal growth response, thereby affecting respiration and food reserves.
10. **Expected Results:**

    Weeds: Weeds start to twist between 2 - 20 days after spraying, depending on weather conditions, formulation and weeds. Following the twisting and bending, plants will turn brown and then die. Only emerged weeds will be controlled.

    Crops: Yellowing and thinning of the crop may be noticed if higher than recommended rates are used. **Poor resultsmay occur if** extremely hard water is used or incorrect rate of MCPA is used in tank mixes.
11. **Effects of Rainfall:** Rain within 2 hours of application will decrease activity.
12. **Movement in Soil:** Readily leached from soil. Longer residual in dry soil.
13. **Cropping Restrictions:**

    Drift: Danger from drift with Amine and salts is lower than from Esters.

    Grazing restrictions: Do not graze or cut for greenfeed until 7 days after spraying. Seedling red clover for forage: Do not graze or cut for green feed in the first year.
14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 700 - 880 mg/kg. Low toxicity to fish. May cause burns upon contact with skin and eyes, and it can be absorbed through the skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** If frozen, warm to 5°C and mix well before using.
17. **Resistance Management:** MCPA is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to MCPA and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Mecoprop/Compitox *(mecoprop)*

Group 4

Manufacturer: United Agri Products/Nufarm Canada

CAUTION POISON

1. **Formulations:** Liquid; Compitox; 150 g/L; 4 L, 8 L containers, Mecoprop; 150 g/L; 10 L containers.
2. **Registered Mixes:** MCPA for turf only.
3. **Crops:** Barley (9.0), durum wheat (8.7), lawns, oats, spring wheat (8.7), turf.

   Underseeding: Not recommended.

Mecoprop/Compitox (cont'd)

4. **Weeds Controlled:**

black medic (Mecoprop only)
buttercup
chickweed (7.6)
cleavers
corn spurry (7.3)
ground ivy
lamb's-quarters
plantain
volunteer clover
wild mustard

5. **Weeds Suppressed:** Canada thistle (top growth control) (4.6).

6. **When Used:**

Crop stage: 3 leaf to early flag leaf.

Weed stage: 2 - 4 leaf and mature plants.

7. **How to Apply:**

With: Ground equipment.

Rate: Cereals: 2.2 - 2.8 L/ac. Lawns, turf: 2.2 - 3.4 L/ac. Low rate for seedling weeds. High rate for mature weeds.

Water volume: Cereals: 80 - 120 L/ac. Lawns, turf: 80 - 160 L/ac.

Pressure: 300 kPa.

Nozzles: Flat fan recommended.

8. **Application Tips:** Recommended water volume is essential for optimum weed control. Cold weather and drought may cause a delay in weed control action. Do not spray bentgrass when temperatures are above 27°C, particularly if high rates are used.

9. **How it Works:** A systemic that disrupts the plant's translocation system causing the accumulation of plant food in the shoots and subsequent starvation of the roots.

10. **Expected Results:**

Weeds: Leaf curling and stem twisting should be visible within 4 - 5 days after spraying. Weeds should be dead within 3 - 4 weeks of application.

Crop: Deformed heads, missing florets and twisted awns could result if recommendations are not followed or if crop is under stress conditions.

11. **Effects of Rainfall:** Rain within 4 - 6 hours will reduce effectiveness.

12. **Movement in Soil:** Readily leached from soils. Longer residual in dry soil.

13. **Cropping Restrictions:**

Succeeding crops: No restrictions.

Drift: Danger of vapour drift is low.

Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 1,060 mg/kg.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store above 0°C. If stored for 1 year or longer, shake well before using.

17. **Resistance Management:** Mecoprop/Compitox is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Mecoprop/Compitox and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Muster *(ethametsulfuron methyl)*

Group 2

Manufacturer: **DuPont Canada Inc.**

CAUTION POISON

1. **Formulations:** Dry flowable: 75%; Toss-N-Go 320 grams, (4 x 80 gram) water soluble pouches.
2. **Registered Mixes:** Assure II, Poast Ultra.

Surfactants: Agral 90, Ag-Surf, Citowett Plus, Super Spreader.

Mixing instructions:

1. Fill tank with 1/2 - 3/4 amount of required water with agitator running.
2. Add the required amount of Muster and ensure it is completely in suspension.
3. Add remainder of water, then add surfactant. Continuous agitation is required.
4. For tank mixtures with Assure II or Poast Ultra: Ensure the Muster pouches have completely dissolved, then add the required amount of Assure II or Poast Ultra with agitator running. Once the herbicide is completely in suspension, slowly add the required amount of partner surfactant (Assure II/Sure-Mix, Poast Ultra/Merge). Additional surfactant is not required.

3. **Crops:** Canola (spring), condiment mustard (Brown and Oriental mustards only).
4. **Weeds Controlled:**

Muster 8 g/ac

flixweed (spring seedlings) (8.3)
green smartweed (7.3)
hemp-nettle (8.1)
wild mustard (8.0)

Muster 12 g/ac

flixweed
hemp-nettle
green smartweed (7.7)
stinkweed (7.9*)
wild mustard

* Controlled at 8 g/ac of Muster when tank mixed with Assure II + Sure-Mix or Poast Ultra + Merge.

5. **Weeds Suppressed:**

Muster 8 g/ac stinkweed (7.1) **Muster 12 g/ac** redroot pigweed (7.0)

6. **When Used: Crop stage**: Canola: 2 leaf to the beginning of bolting. Condiment mustards: 4 leaf to late rosette stage.

Weed stage: Cotyledon to 6 leaf stage of the target weeds. Stinkweed: 1 - 4 leaf stage and actively growing.

7. **How to Apply:**

With: Ground equipment only. Do not apply by air.

Rate:

Muster alone: 8 - 12 g/ac (apply with 2.0 L of surfactant in 1,000 L of spray volume). Not more than 8 g/ac on Brown or Oriental mustards.

Muster + Assure II: 8 - 12 g/ac + 0.15 - 0.2 L/ac + 5 L/1,000 L Sure-Mix. Do not apply in combination with other pesticides.

Muster + Poast Ultra: 8 - 12 g/ac + 130 - 190 mL/ac. (Use surfactant as outlined on Poast Ultra label).

Water volume: 40 L/ac.

Pressure: 210 - 275 kPa.

Nozzle: Flat fan recommended. Use 50 mesh screens or larger (metal or nylon).

Muster (cont'd)

Sprayer cleanup: To avoid injury to susceptible crops, thoroughly clean sprayer immediately after spraying. Ammonia must be used to deactivate Muster when cleaning equipment.

1. Drain tank and flush tank, boom and hoses with clean water for a minimum of ten minutes. Visually inspect tank to assure removal of all visible residues of Muster. If necessary, repeat step 1.
2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water and ammonia to completely fill tank so that all surfaces are in contact with the solution. Allow to sit for 15 minutes **with agitation**. Again, flush the hoses, boom and nozzles with the cleaning solution and drain tank.
3. Remove the nozzles and screens, and clean separately in a bucket containing cleaning agent and water.
4. Repeat Step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips:** For optimum weed control, apply Muster at the cotyledon to 6 leaf stage of the target weeds. For best control of stinkweed, apply Muster plus surfactant on actively growing emerged stinkweed in the 1 - 4 leaf stage. When very high weed seedling population occurs, larger seedlings may interfere with coverage of smaller seedlings and control may be reduced. Regrowth may also occur if crop competitiveness is reduced by thin stands and/or reduced vigour.
9. **How it Works:** Absorbed by foliage and roots. Inhibits cell elongation.
10. **Expected Results:** Weed growth stops almost immediately. **Poor results may be expected if** improper mixing, timing or coverage, or when weeds are under drought stress or moisture stress.
11. **Effects of Rainfall:** If rain occurs soon after application, control may be reduced. 4 - 6 hours of dry weather are needed to allow Muster to be absorbed by weed foliage. Environmental conditions that slow the drying of Muster on the foliage, such as high relative humidity, cool air temperature or cloud cover, may increase the time required.
12. **Movement in Soil:** Movement is restricted by finely textured soils, soil organic matter and neutral-to-acidic conditions.
13. **Cropping Restrictions:**

    Minimum crop rotation guidelines: Minimum interval is that from the last application of Muster to date of planting the rotational crop.

    Interval prior to planting (months after application):

    10 months – spring wheat, durum wheat, barley, flax, oats.

    22 months – alfalfa, canary grass, canola, drybeans, fababeans, fescue, lentils, peas, red clover, tame mustard. All other crops, field bioassy at 22 months.

    Grazing restrictions: Do not graze or feed crop to livestock within 60 days of treatment. Do not harvest within 60 days of treatment.

    * Wherever Muster is used on land previously treated with Ally herbicide, read the rotational guidelines on both labels and follow the label with the longest interval stated for your situation.

14. **Toxicity:** Low acute mammaliam toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a cool, dry place.

17. **Resistance Management:** Muster is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Muster and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Muster Gold II *(quizalofop-p-ethyl + ethametsulfuron methyl)*

Group 1,2

Manufacturer: DuPont Canada Inc.

CAUTION POISON

1. **Formulations:**

Muster (dry flowable): 75%; 320 grams, (4 x 80 grams) water soluble pouches.

Assure II (emulsifiable concentrate): 96 g/L; 1 x 8 L + 1 jug Merge (adjuvant).

2. **Registered Mixes:** None.
3. **Crops:** Canola (spring).
4. **Weeds Controlled:**

barnyard grass
flixweed (spring seedlings)
green foxtail
green smartweed
hemp-nettie
stinkweed
volunteer barley
volunteer wheat
wild mustard
wild oats

5. **Weeds Suppressed:** Quackgrass at 200 mL/ac rate.
6. **When Used:**

Crop stage: 2 leaf to the beginning of bolting.

Weed stage: Annual grasses: 2 leaf to early tillering stage. Wild oats: prior to tillering. Quackgrass: 2 - 6 leaf stage. Broadleaf weeds: cotyledon to 6 leaf stage Stinkweed: 1 - 4 leaf stage and actively growing.

7. **How to Apply:**

With: Ground equipment only. Do not apply by air.

Rate: Assure II 200 mL/ac + Muster 8 g/ac plus 5 L of Merge per 1,000 litres spray solution.

Water volume: Minimum of 40 L/ac.

Pressure: 210 - 275 kPa.

Nozzles: Use flat fan nozzles. Do not use flood jet nozzles. Use 50 mesh screens or larger.

Mixing instructions:

1. Fill tank 1/2 - 3/4 amount of required water with agitator running.
2. Add the required amount of Muster and ensure it is completely in suspension.
3. Add required amount of Assure II and continue agitating.
4. Add remainder of water, then add the Merge (adjuvant). Continuous agitation is required.

Muster Gold II (cont'd)

Sprayer cleanup: To avoid injury to susceptible crops, thoroughly clean sprayer immediately after spraying. Ammonia must be used to deactivate Muster when cleaning equipment.

1. Drain tank and flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect the tank to assure removal of all visible residues of Muster. If necessary, repeat step 1.
2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum of 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, then add more water and ammonia to completely fill tank so that all surfaces are in contact with the solution. Allow to sit for 15 minutes with agitation. Again, flush the hoses, booms and nozzles with the cleaning solution and drain the tank.
3. Remove nozzles and screens, and clean separately in bucket containing cleaning agent and water.
4. Repeat step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips:** Best results on wild oats if application is made prior to tillering. For optimum control, apply Muster Gold II at the cotyledon to 6 leaf stage of the target broadleaf weeds. For stinkweed, apply Muster Gold II when actively growing: 1 - 4 leaf stage. When very high weed seedling population occurs, larger seedlings may interfere with coverage of smaller seedlings, and control may be reduced. Regrowth may also occur if crop competitiveness is reduced by thin stands and/or reduced vigour. Do not apply Muster Gold II to plants stressed by severe conditions such as drought, low fertility, saline soils, waterlogged soils, disease or insect damage as crop injury may result.
9. **How it Works:** Assure II is a systemic herbicide that is rapidly absorbed and readily translocated from the treated foliage to the root system and growing points of the plant. Muster is absorbed by the foliage and roots. Inhibits cell elongation.
10. **Expected Results:** Broadleaf weed growth stops almost immediately. Grassy weeds show a reduction in growth and a loss of competitiveness. An early yellowing or browning of the younger plant tissues is followed by a progressive collapse of the remaining foliage. These results will generally be observed in 1 - 3 weeks, depending on the grass species treated and the environmental conditions. **Poor results may be expected if** there is improper mixing, timing or coverage, or when weeds are under stress.
11. **Effects of Rainfall:** If rainfall occurs soon after application, control may be reduced. Four to six hours of dry weather are needed to allow Muster Gold II to be absorbed by weed foliage. Environmental conditions that slow the drying of Muster Gold II on the foliage, such as high relative humidity, cool air temperature or cloud cover, may increase the time required.
12. **Movement in Soil:** Movement is restricted by finely textured soils, soil organic matter and neutral to acidic conditions.
13. **Cropping Restrictions:**

    Minimum crop rotation guidelines: Minimum interval is that from the last application of Muster Gold II to the date of planting the rotational crop.

    Interval prior to planting (months after application):

    10 months – spring wheat, durum wheat, barley, flax, oats.

    22 months – alfalfa, canary grass, canola, drybeans, fababeans, fescue, lentils, peas, red clover, tame mustard.

    All other crops, field bioassay at 22 months.

    Grazing restrictions: Do not graze treated fields or harvest for forage or hay. Do not harvest within 64 days of treatment.

    * Wherever Muster is used on land previously treated with Ally herbicide, read the rotational guidelines on both labels and follow the label with the longest interval stated for your situation.

14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) >5,000 mg/kg. May irritate eyes, nose, throat and skin.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a cool, dry place, but not below 5°C.
17. **Resistance Management:** Muster Gold II is both a Group 1 and a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Muster Gold II and other Group 1 and 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Nortron *(ethofumesate)*

Group 16

Manufacturer: Bayer CropScience

1. **Formulations:** Suspension concentrate: 480 g/L; 10 L jug.
2. **Registered Mixes:** Ro-Neet, Pyramin.
3. **Crops:** Sugar beets.
4. **Weeds Controlled:**

    barnyard grass
    foxtail
    kochia
    lady's-thumb
    lamb's-quarters
    pigweed
    purslane
    redroot
    shepherd's-purse
    volunteer barley
    volunteer oats
    volunteer wheat
    wild oats

5. **Weeds Suppressed:** Black nightshade, Russian thistle, wild buckwheat.
6. **When Used:** Nortron may be fall-layered, spring-applied before planting and pre-emergence.
7. **How to Apply:**

    With: Ground equipment.

    Rate: Dependent upon soil type – 1.3 L - 3.3 L per acre broadcast; 0.4 - 1.13 L per acre applied on an 18 cm band/ 55 cm row.

    Norton + Pyramin tank mix: For medium textured soils (silt and clay loams with <3% organic matter) 1.48 L/ac Nortron + 2.12 L/ac Pyramin broadcast basis; **or** 0.48 L/ac Nortron + 0.7 L/ac Pyramin applied on an 18 cm band/55 cm row. **Note:** This tank mix is not recommended on light textured soils (sands, loamy sands and sandy loams).

    Water volume: 44 - 222 litres per acre.

    Pressure: Apply Nortron to the soil using standard low pressure (150 - 350 kPa) spray equipment.

    Nozzles: Do not use smaller than 50 mesh strainer nor less than an 8002E nozzle orifice.

Nortron (cont'd)

8. **Application Tips:** Apply Nortron before or at planting time and incorporate into the soil to a depth of 2.5 - 5.0 cm. Deeper incorporation may reduce effectiveness. Nortron may be applied pre-emergence at the time of planting or shortly after, but prior to weed emergence.

   Incorporation equipment: Hooded-power or ground-driven rotary tillers, rolling cultivators and harrows are most effective for incorporating Nortron into the soil. Do not apply Nortron through soil injector shanks. Large clods can reduce the effectiveness of Nortron. All existing vegetative growth should be thoroughly worked into the soil before treatment. Do not allow spray mixture to stand in tank overnight.

9. **How it Works:** Uptake of ethofumesate occurs primarily via the emerging shoot as it passes upwards through treated soil; however, for certain broadleaf species, root uptake is more important. Ethofumesate is non-volatile, and in all cases, uptake occurs from aqueous solution.

10. **Expected Results:** Nortron, applied pre-plant incorporated with proper activation, will normally not permit weed emergence. If emergence should occur, uptake has occurred; seedling will show loss of vigour and eventual death.

11. **Effects of Rainfall:** Normally 1.5 cm of rainfall is sufficient to activate Nortron. In areas where moisture can be marginal, incorporation is recommended.

12. **Movement in Soil:** Under normal conditions, ethofumesate is only slowly leached from the soil surface, and most of the material remains concentrated in the upper 15 cm.

13. **Cropping Restrictions:** Do not rotate with any crops other than sugar beets for 12 months after application. Thorough tillage, including moldboard plowing, should precede the planting of crops other than sugar beets. Do not use Nortron on muck or peat soils. If crop is lost due to climatic or soil conditions following application of Nortron, do not plant crops other than sugar beets in Nortron-treated land during the same season. If fields are replanted to sugar beets, reseed into treated band. Do not retreat field with Nortron. To reduce injury to rotational crops following a dry sugar beet season, Nortron should be applied only in a band, and field should be moldboard plowed after harvest. Wheat and barley may be injured if planted following a dry sugar beet year.

    Grazing restrictions: Where Nortron is used in combination with TCA, do not use treated sugar beet tops for feed or forage.

14. **Toxicity:**

    S.C. formulation
    Acute oral LD_{50} (rat): 2,100 mg/kg
    Acute dermal LD_{50} (rat): >4,100 mg/kg

    Technical material
    Acute oral LD_{50} (rat): 6,400 mg/kg
    Acute oral LD_{50} (bobwhite quail): >8,343 mg/kg
    Acute dermal LD_{50} (rat): >1,440 mg/kg
    Dietary LD_{50} (mallard duck): >10,000 mg/kg

    Toxic to fish

    Danger: Eye irritant. Causes eye or skin irritation. Do not get in eyes, on skin or on clothing. Harmful if swallowed. **Avoid inhalation of fumes.**

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes, immediately flush with water for 15 minutes. **If on skin**, wash with soap and water.
    If in eyes or on skin, use standard first aid measures. **If swallowed**, call a physician or Poison Control Centre. Drink one or two glasses of water and induce vomiting by touching the back of the throat with a finger.

    Environmental hazards: Keep out of lakes, ponds or streams. Do not contaminate water by cleaning of equipment or disposal of wastes.

16. **Storage:** Do not use or store near heat or open flames. Store **Nortron** in a cool place, above 0°C.
17. **Resistance Management:** Nortron is a Group 16 herbicide. Any weed population may contain or develop plants naturally resistant to Nortron and other Group 16 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Odyssey *(imazamox + imazethapyr)*

Group 2

Manufacturer: BASF Canada

1. **Formulations:** Water dispersible granular; 70% (imazamox – 35% + imazethapyr – 35%); 4 - 173 g water soluble bags or 8 x 86.5 water soluble bages and 1 x 8.1 L jug of Merge.
2. **Registered Mixes:** Lontrel (CLEARFIELD Canola).

   Surfactants: Merge (included in case) at 0.5% of the water volume.

   Mixing instructions: Use a 50 mesh (or coarser) filter screen. Fill sprayer tank with 3/4 the required amount of clean water, start agitation and continue agitation throughout the entire mixing and spraying procedure. Add the required amount of Odyssey soluble bag(s) directly into the sprayer tank opening. Agitate for at least 10 minutes to dissolve herbicide, if mixing with Lontrel, add Lontrel to the tank and agitate, mixing thoroughly. Add the required amount of Merge. Complete filling the tank to the desired level with water.
3. **Crops:** Alfalfa (seedling and established grown for seed), CLEARFIELD canola, field peas.
4. **Weeds Controlled:**

   17 g/ac

   barnyard grass
   chickweed
   cleavers
   flixweed
   green foxtail
   green smartweed
   hemp-nettle*
   lamb's-quarters**
   Persian darnel
   redroot pigweed
   Russian thistle
   shepherd's-purse
   stinkweed
   stork's-bill
   volunteer barley
   volunteer canola (except CLEARFIELD canola)
   volunteer tame oats
   volunteer tame mustard
   volunteer wheat
   wild buckwheat*
   wild mustard
   wild oats

   * Suppression in field peas.
   ** Suppression in field peas and CLEARFIELD canola.
5. **Weeds Suppressed:** Kochia, lamb's-quarters.
6. **When Used:**

   Crop stage: Alfalfa: 1 - 4 leaf stage and after the weeds have emerged. CLEARFIELD canola (all soil zones): 2 - 6 true leaf. Field peas: 1 - 6 node of field peas and after the weeds have emerged.

   Weed stage: Grasses: Apply from the 1 - 4 true leaf stage up to early tillering. Broadleaf weeds: Apply from the cotyledon to 4 leaf stage.

Odyssey (cont'd)

7. **How to Apply:**

With: Ground equipment only.

Rate: 17 g/ac.

Surfactant: Merge at 0.5% v/v (e.g. 5 L/1,000 L spray solution).

Water volume: 40 L/ac.

Pressure: 275 kPa.

Nozzles: 50 mesh screens (or coarser). Flat fan recommended tilted 45° forward for better penetration.

Incorporation: Not applicable.

8. **Application Tips:** Water soluble bags will dissolve better when kept intact, do not split bags. If agitation is stopped for more that 5 minutes, re-suspend spray solution by full agitation prior to commencing spraying again. Do not spray if freezing temperatures are forecast. Initial transient crop yellowing may be observed after application, but this is outgrown and should not affect yield.

9. **How it Works:** Absorbed by foliage and roots. Disrupts plant metabolism causing growth to stop. Works best under good growing conditions. Residual activity of small seeded, shallow germinating flushing weeds (not wild oats) expected until crop flowering. Moist conditions result in beter residual control.

10. **Expected Results:** Susceptible weeds stop growing within 24 - 48 hours. Yellow striping and purplish or reddish discolouration of the leaves may occur. Leaves begin to die in 3 - 10 days starting with the youngest and moving to the older leaves. Death of the plant may occur in 1 - 3 weeks.

11. **Effects of Rainfall:** Insufficient data, recommend 6 hours between application and rainfall.

12. **Movement in Soil:** Not leached appreciably.

13. **Cropping Restrictions:**

Minimum interval to harvest: 60 days.

Succeeding crops: Barley, CLEARFIELD canola, canary seed, durum wheat, lentils, oats and spring wheat can be grown safely the year following an application. Flax and non-CLEARFIELD canola can be grown in the second year after an Odyssey application (e.g. if you used Odyssey in 2002, you can grow conventional canola in 2004). For other crops, call BASF at 1-877-371-2773. Conduct a field bioassay the year before growing any crops other than those listed above. In case of crop failure, replant only to CLEARFIELD canola or field peas.

Grazing restrictions: Do not graze treated crops or cut for hay; there are not sufficient data to support such use. Field peas treated with Odyssey may be fed to livestock 30 days after application. Only apply Odyssey once per year.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) 5,000 mg/kg. Non-toxic to fish, birds and bees.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store at temperatures above 5°C. Keep unused water soluble bags in resealed, original container. Keep packages dry at all time.

17. **Resistance Management:** Odyssey is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Odyssey and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Pardner/Koril *(bromoxynil)*

Group 6

Manufacturer: **Bayer CropScience/Nufarm Canada**

WARNING POISON

1. **Formulations:** Emulsifiable concentrate; Pardner: 280 g/L, 8 L jug; Koril: 235 g/L, 9.71 L jug.
2. **Registered Mixes: Pardner:** Low rate Atrazine (corn, sweet, field); Avenge or Avenge + MCPA Ester (barley, Avenge wheat varieties); Banvel (field corn), Hoe-Grass 284 [barley (**not** Betzes or Klages), seedling grasses (brome, creeping red fescue, crested and intermediate wheatgrass, Russian wild ryegrass), spring wheat]. MCPA (Amine, Ester, K-salt) (barley, oats, wheat, canary seed, seedling grasses, fall rye); Roundup (chemical fallow); 2,4-D (Amine, Ester) (barley, wheat). Achieve 40/80 DG (barley, wheat), Horizon (wheat), Ultim or Ultim + Atrazine (corn), Accent (field corn).

   Koril: Atrazine (field corn, sweet corn). MCPA (Amine, Ester, K-salt) barley, oats and wheat. 2,4-D (Amine, Ester) barley and wheat.

   Mixing restrictions: Add Atrazine; MCPA; or 2,4-D to water first, then Pardner/Koril.
3. **Crops:**

   Underseeding: Not recommended for legumes other than alfalfa.

   alfalfa (seedling)
   barley (9.0)
   canary seed (9.0)
   durum wheat (8.9)
   fall rye
   field corn (9.0)
   garlic
   oats (8.8)
   spring wheat (8.9)
   sweet corn (8.3)
   triticale (9.0)
   winter wheat (8.9)

   Seedling grasses for seed production

   bromegrass (8.7)
   creeping red fescue (8.6)
   crested wheatgrass (8.3)
   intermediate wheatgrass
   meadow fescue (8.3)
   orchard grass (8.6)
   reed canary grass (8.3)
   Russian wild rye (8.9)
   slender wheatgrass
   tall wheatgrass
   timothy (8.8)

   Established alfalfa (for seed production only).

   Note: Koril is registered on the following crops only: barley, durum wheat, field corn, oats, spring wheat, sweet corn, winter wheat.
4. **Weeds Controlled:**

   American nightshade
   annual smartweed (8.1)
   black nightshade
   bluebur
   cocklebur
   common groundsel (9.0)
   common ragweed
   cow cockle (6.9)
   knawel (7.7)
   kochia
   lady's-thumb
   lamb's-quarters (8.4)
   night-flowering catchfly (8.0)
   redroot pigweed (7.9)*
   Russian thistle (8.4)
   stinkweed (8.4)
   tartary buckwheat (8.4)
   volunteer buckwheat (8.4)
   wild buckwheat (8.4)
   wild mustard (8.5)

   * Triazine resistant.
5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Barley, canary seed, corn (field, sweet), oats, triticale, wheat: 2 leaf to early flag leaf. 2,4-D mix on wheat or barley after 4 leaf. Winter wheat, fall rye: first growth to early flag leaf. Corn: Pardner/Koril alone or Atrazine mix: until crop is 25 cm tall. Canary seed: 3 - 5 leaf. Seedling grasses, grown for seed production: 2 - 4 leaf. Seedling alfalfa: 2 - 6 trifoliate stage.

   Established alfalfa: Treat at any stage of growth; maximum 2 applications per year.

   Weed stage: Seedling to 4 leaf stage, except Russian thistle to 5 cm tall. Generally best results if weeds are in seedling stage. Scentless chamomile and knawel: before 3 leaf stage.

Pardner/Koril (cont'd)

7. **How to Apply:**

With: Ground equipment or aircraft (wheat and barley only). Spra-coupes not recommended.

Rate:

Crop	Pardner	Koril
Barley, field corn, oats, sweet corn, triticale, wheat	405 - 485 mL/ac	486 - 567 mL/ac
Canary seed	405 mL/ac	
Fall rye, winter wheat	405 - 485 mL/ac	486 - 567 mL/ac
Seedling grasses (grown for seed production only)	405 - 485 mL/ac	
Seedling alfalfa	405 mL/ac	
Established alfalfa (for seed production only)	405 - 485 mL/ac	

Water volume: 40 L/ac. Corn: 60 L/ac; 8 L/ac (air).

Pressure: 275 kPa.

Nozzles: Flat fan nozzles recommended or Hollow cone (air only).

8. **Application Tips:** Avoid spraying crops during adverse growing conditions, especially drought, high temperatures (over 29°C) or in high humidity.

9. **How it Works:** A contact herbicide, so good coverage is essential. Inhibits respiration and photosynthesis causing death.

10. **Expected Results:**

Weeds: Turn brown and die within 3 - 5 days – more rapid under good growing conditions and when applied to seedling weeds. **Poor results can be expected if** weeds past 4 leaf stage, poor spray coverage or lower than recommended rate used. Injury to corn may occur if under stress.

11. **Effects of Rainfall:** None.

12. **Movement in Soil:** None.

13. **Cropping Restrictions:**

Succeeding crops: No restrictions.

Grazing restrictions: Do not graze or harvest for green feed until 30 days after treatment.

14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 440 mg/kg. Very toxic to fish. Intake of a large dose may cause convulsions, sudden collapse and coma. Can be absorbed through the skin.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

Symptoms of acute poisoning: Stomach cramps, diarrhea, sore throat may appear.

16. **Storage:** Pardner and Koril formulations will solidify at temperatures below -20°C, but will be usable again at temperatures above 0°C.

17. **Resistance Management:** Pardner/Koril is a Group 6 herbicide. Any weed population may contain or develop plants naturally resistant to Pardner/Koril and other Group 6 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Pea Pack *(metribuzin + MCPA Na-salt)*

Group 5,4

Manufacturer: **Bayer CropScience**

CAUTION POISON

1. **Formulations:**

   Sencor 75 DF: Dispersible granule; 750 g/kg; 1 x 3 kg container.

   MCPA Na-salt: Solution; 300 g/L; 1 x 7.6 L container.

2. **Registered Mixes:** None.
3. **Crops:** Field peas, processing peas only. **Do not** use on lentils or chickpeas. **Do not** use on soils with less than 3% organic matter.
4. **Weeds Controlled:**

   green smartweed
   lady's-thumb
   lamb's-quarters
   redroot pigweed
   stinkweed
   volunteer canola (including all herbicide tolerant canola's except triazine-tolerant cultivars)
   wild mustard

5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Apply before pea vines are 15 cm long or before the 6 node stage. Crop tolerance is not affected by early application. Do not use if soil has less than 3% organic matter.

   Weed stage: Apply post-emergent when weeds are small, i.e. less than 5 cm in height or diameter.

7. **How to Apply:**

   Rate: 77 g/ac Sencor DF and 190 mL/ac MCPA Na-salt per acre.

   Water volume: 70 L/ac.

   Pressure: 200 - 275 kPa.

   Nozzles: Flat fan nozzles with an opening no smaller than 8002 or TK2 with 50 mesh screen. Angle nozzles 45° forward.

   Sprayer cleanup: Spray equipment must be thoroughly cleaned to remove traces of herbicide that might injure other crops to be sprayed.

   1. Drain any remaining solution from the spray tank.
   2. Rinse the spray tank.
   3. Refill with water, adding a heavy-duty detergent at the rate of 0.25 L per 100 L of water. Recycle this mixture through the equipment for 5 minutes and spray out.
   4. Repeat this procedure twice.
   5. Fill the spray tank with clean water, recycle for 5 minutes, and spray out.
   6. Clean pump and nozzle screens thoroughly.
   7. Wash away and spray mixture from the outside of the spray tank, nozzles or spray rig.

8. **Application Tips:** Allow 4 - 5 days between applications of Pea Pack and the application of a post-emergent wild oat herbicide. Allow 4 - 5 days after frost for crop to recover before applying Pea Pack. Weed control may be reduced if Pea Pack is applied later than the 6th node of crop.
9. **How it Works:** Sencor is a systemic herbicide that kills weeds by stopping photosynthesis. MCPA sodium salt is a systemic herbicide that disrupts cell division. MCPA sodium salt is absorbed through leaves and roots and is translocated to actively growing areas in the plant.
10. **Expected Results:**

    Broadleaf weeds: For weeds susceptible to Sencor 75DF, initial yellowing will occur within 7 - 10 days; weeds turn brown and die within 14 - 16 days. For weeds susceptible to MCPA Na-salt, twisting begins between 2 - 20 days after application, followed by the plant turning brown and dying.

Pea Pack (cont'd)

Crop: Yellowing may occur if high temperatures take place within 48 hours of application. Cold, cloudy weather or frost within 3 days of application may cause reduced weed control and some yellowing of crop. If frost occurs, allow 4 - 5 days for crop to recover prior to applying Pea Pack. Applications made under conditions of high humidity may cause pea vines to droop, but the crop will recover quickly.

11. **Effects of Rainfall:** Rainfall within 6 hours after application may reduce weed control of Pea Pack, and within 2 hours may reduce weed control of MCPA Na-salt.
12. **Movement in Soil:** For Sencor 75DF, little leaching occurs in soil with a high organic matter. MCPA Na-salt is readily leached from soil. Longer residual in dry soil.
13. **Cropping Restrictions:**

    Re-cropping: No re-cropping restrictions in the year following application.

    Grazing restrictions: Do not graze peas within 70 days of application.

    Other restrictions:

    Pre-harvest: Do not harvest peas within 70 days of application.
14. **Toxicity:**

    Sencor 75 DF: Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 1,100 - 2,300 mg/kg. Slightly toxic to fish and birds.

    MCPA Na-salt: Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 700 - 800 mg/kg. Low toxicity to fish. May cause burns upon contact with skin and eyes, and it can be absorbed through the skin.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:**

    Sencor 75 DF: No damage by freezing, but avoid large temperature fluctuations. Store in a cool, dry place.

    MCPA Na-salt: If frozen, warm to 5°C and mix well before using.
17. **Resistance Management:** Pea Pack is both a Group 4 and a Group 5 herbicide. Any weed population may contain or develop plants naturally resistant to Pea Pack and other Group 4 and 5 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Poast Ultra *(sethoxydim)*

Group 1

Manufacturer: **BASF Canada**

CAUTION POISON

1. **Formulations:** Emulsifiable concentrate; 450 g/L; 1 x 7.7 L Poast Ultra + 2 x 8.1 L Merge.
2. **Registered Mixes:**

    Canola: Lontrel, Muster, Pursuit (CLEARFIELD canola only), Liberty (Liberty Link canola only).

    Flax: Buctril M, MCPA Ester, Lontrel, Lontrel + MCPA Ester.

    Field peas: Pursuit.

Mixing instructions:

Poast Ultra + Pursuit: A reduced rate of Pursuit (42.5 mL/acre) can be used when Poast Ultra and Pursuit are tank mixed. The 85 mL/ac rate of Pursuit may also be tank mixed with Poast Ultra. Do not use a rate of Poast Ultra less than 190 mL/acre in tank mixes with Pursuit.

Poast Ultra + Liberty + Merge: A reduced rate of Poast Ultra (95 mL/ac) can be tank mixed with Liberty to control volunteer barley. Merge should be added at 200 mL/ac using 45 mL/ac water volume. Refer to Liberty label for use instructions.

Usual mix order	Mix order exceptions
1. Poast Ultra	1. Muster
2. Broadleaf herbicide	2. Poast Ultra
3. Merge	3. Merge

3. Crops:

adzuki beans (9.0)
alfalfa
(seedling & established)
asparagus
broccoli
buckwheat
cabbage
caraway
carrots
cauliflower
chickling vetch
chickpeas
chokecherry (shelterbelts)
common beans (9.0)
coriander
cranberry
creeping red fescue
(seed production only)
cucumbers* (8.9)
dill
dry bulb onions (8.8)
dry common beans (9.0)
ethnic cole crops
fababeans (9.0)
field peas (9.0)
field peppers
flax (including
low linolenic)(9.0)
fresh peas (9.0)
garlic
green peppers
highbush blueberries
hops
lentils (9.0)
lima beans (9.0)
linola
mung beans (9.0)
mustard
orchards (newly
planted, non-bearing)
peppermint
potatoes (9.0)
processing peas (9.0)
pumpkin
rapeseed
(including canola)(9.0)
raspberry
safflower
shrubs (fruit bearing)
snap beans (9.0)
soybeans (9.0)
spearmint
spinach
squash
strawberry
sugar beets (9.0)
sunflower
sweet potatoes
tomatoes
trees (fruit bearing &
non-fruit bearing)
turnip

Forage legumes for seed (seedling & established)

alfalfa
alsike clover
cicer milkvetch
sainfoin
sweet clover

4. Weeds Controlled:

barnyard grass (8.6)
crabgrass
fall panicum
green foxtail (8.3)
Persian darnel (8.7)
quackgrass (6.0)*
volunteer barley (8.5)
volunteer corn (7.0)
volunteer oats (8.4)
volunteer spring wheat (8.4)
wild oats (8.4)
wild proso millet
witchgrass
yellow foxtail

* Season-long control.

5. Weeds Suppressed: Foxtail barley, quackgrass.

6. When Used:

Weed stage: Annual grasses: 1 - 6 leaf stage (optimium results at 2 - 5 leaf stage when annual grasses are small and actively growing). Wild oats and volunteer cereals: 1 - 4 leaf stage (best results prior to tillering). Quackgrass: up to 3 leaf (8 - 12 cm tall). Foxtail barley: 1 - 4 leaf.

7. How to Apply:

With: Aircraft or ground equipment.

Rate:

Poast Ultra/Merge Application Rate Table

			Merge**		
Grass species controlled	**Grass leaf stage**	**Poast Ultra* mL/ac**	**Ground application water volume 20 - 44 L/ac**	**45 - 80 L/ac**	**Aerial application water volume 10 - 20 L/ac**
Annual grasses	1 - 6	130	0.2 - 0.4	0.4	0.1 - 0.2
Barnyard grass, crabgrass (large), fall panicum, green foxtail, Persian darnel, proso millet, volunteer corn, witchgrass, yellow foxtail					
Wild oats, volunteer cereals **(Canola, flax and peas only)**	1 - 4				
Annual grasses – listed above including volunteer cereals, wild oats	1 - 6	190	0.2 - 0.4	0.4	0.1 - 0.2
Suppression of quackgrass (Western Canada only)	2 - 5				
Quackgrass control	Up to 3	445	N/A	0.4 - 0.8	N/A
Suppression of foxtail barley plus annual grasses listed above	1 - 4				

* For band application, adjust rate per acre in relation to the band width (annual grasses only).

** For ground application, it is recommended to use 2 jugs of Merge with every jug of Poast Ultra regardless of water volume.

Water volume: Air: 10 - 20 L/ac. Ground: 20 - 45 L/ac. Dense foliage, heavy infestations and for quackgrass control: 45 - 80 L/ac.

Pressure: Air: 200 kPa. Ground: 240 kPa with low water volumes; 275 - 425 kPa with higher water volumes.

Nozzles: Flat fan only. Tilt forward 45° for better coverage. **The use of flood jet or hollow cone nozzles is not recommended because of uneven and inadequate spray coverage.**

8. Application Tips:

Poast Ultra applied at 130 mL/ac for the control of wild oats and volunteer cereals should only be applied under the following conditions:

- adequate moisture
- adequate fertility
- moderate temperatures (15°C - 28°C)
- absence of stress
- canola, flax and peas only (good crop stand is essential)
- early timing (1 - 4 true leaf stage of volunteer cereals and wild oats)
- light to moderate weed infestation levels
- low water volumes (20 - 40 L/ac)

Treat when weedy grasses are actively growing, there is good soil moisture and crop is small enough to permit thorough spray coverage. If annual grass weeds and broadleaf weeds are not in the correct stages for treatment, apply separate applications of each herbicide. Control of grasses growing under drought, flooding or prolonged cool temperatures under 15°C may be reduced or delayed. Escapes or re-tillering may occur under prolonged stress conditions or low fertility. **Do not apply on grasses stressed longer than 20 days due to lack of moisture as unsatisfactory control can result.** Thorough pre-plant tillage operations are required to fields where sod or forage grass crops may have grown in the previous year. For quackgrass only on cultivated land, pre-plant tillage will fragment rhizomes and improve control. Crop competition generally enhances control of quackgrass. In wide row crops, the quackgrass treatment should be followed by a cultivation after a minimum 7 days. Do not apply where runoff or erosion is likely. Allow 4 days between application of Poast Ultra and any other chemical not recommended as a tank mix combination. Do not allow mixtures to stand. Thoroughly clean sprayer after use by flushing with water and detergent. Prior to using Poast Ultra, ensure that the sprayer has been cleaned according to previous product manufacturer's specifications or sprayer cleanout recommendations. When tank mixing with Pursuit, the rate of Pursuit can be lowered to 42.5 mL/ac for the control of redroot pigweed, stinkweed, wild buckwheat, wild mustard, chickweed, cleavers, hemp-nettle and smartweed.

9. **How it Works:** Poast Ultra is a contact and a systemic herbicide. Absorbed primarily by foliage and translocated to the growing points. Inhibits formation of fatty acids in these tissues. Thorough coverage of the foliage is important for consistent grass control.

10. **Expected Results:** Susceptible grasses stop growing immediately, gradually turn yellow and then brown. The time required for complete control is normally 7 - 21 days (annual grasses). Control of quackgrass develops more slowly than control of annual grasses. Poast Ultra is translocated through the quackgrass plant to the rhizomes and kills actively growing rhizome buds, as well as above ground vegetation. Dormant rhizome buds will remain unaffected by the spray and regrowth can occur from these buds. The regrowth will not be significant until 6 - 8 weeks after treatment, depending on growing conditions, crop cultivation practices and crop competition.

11. **Effects of Rainfall:** Rainfall within 1 hour of application may reduce effectiveness.

12. **Movement in Soil:** Relatively immobile, breaks down rapidly in soil.

13. **Cropping Restrictions:**

Succeeding crops: Allow a minimum of 14 days between application and re-planting of cereal or grass crop. A cultivation to a minimum depth of 10 cm is recommended 7 days prior to seeding. Otherwise no restriction.

Spray to harvest interval (days): Alfalfa (70), beans [snap (56), common (60), white, kidney, pinto (80), adzuki, faba, lima, mung (80)], buckwheat (85), cucumbers (30); flax (60), garlic (50), lentils (65), onions (50); peas [fresh (30), processing (30), dry (60)], potatoes (80), rapeseed (70), soybeans (80); sugar beets (85), tomatoes (60).

Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = formulation 2,500 mg/kg. Causes moderate skin and eye irritation. Low toxicity to birds, fish and bees. Hazards to the environment are low because of rapid breakdown in soil.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

Poast Ultra (cont'd)

16. **Storage:** Store product in a cool, dry place. Freezing will not reduce effectiveness.
17. **Resistance Management:** Poast Ultra is a Group 1 herbicide. Any weed population may contain or develop plants naturally resistant to Poast Ultra and other Group 1 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

PrePass *(florasulam + glyphosate)*

Group 2,9

Manufacturer: Dow AgroSciences Canada Inc.

CAUTION POISON

1 **Formulation:** PrePass A: 50 g/L florasulam SC, 1.6 L jug; PrePass B: Glyphosate: 360 g/L (acid equivalent: present isopropylamine salt); 2 x 10 L jugs.

2. **Registered Mixes:** None.

3. **Crops:** Pre-seed burn-down application prior to planting barley, oats or wheat; summerfallow applications.

4. **Weeds Controlled:**

Canada fleabane
cleavers
common chickweed
common ragweed
crab grass
dandelion*
downy brome
flixweed
giant foxtail
green foxtail
hemp-nettle
lady's thumb
lamb's quarters
narrow-leafed hawk's beard
persian darnel
redroot pigweed
Russian thistle
shepherd's purse
stinkweed
volunteer barley
volunteer canola (conventional, CLEARFIELD & Liberty)
volunteer glyphosate tolerant canola**
volunteer flax
volunteer wheat
wild buckwheat**
wild mustard
wild oats

* Seedlings will be controlled.
** Up to 5 leaf stage.

5. **Weeds Suppressed:**

annual sow-thistle
dandelion*
kochia
perennial sow-thistle

* Rosettes greater than 6" (15 cm) will be suppressed.

6. **When Used:**

Pre-seed burn-down: apply PrePass prior to planting barley, oats or wheat to control emerged labelled weeds.

Summerfallow:

Annual weeds: Grassy and broadleaf weeds that are actively growing.

Dandelion: Seedlings will be controlled; rosettes greater than 6" (15 cm) will be suppressed.

7. **How to Apply:**

With: Ground equipment only. With a sprayer that can apply 40 L/ac of spray solution. Do not apply by air.

Rate: PrePass A: 40 mL/ac. PrePass B: 500 mL/ac.

Water volume: 40 L/ac.

Pressure: Use low pressures 200 - 275 kPa.

Nozzles: Use nozzles that deliver higher volumes and coarser droplets.

Mixing instructions: Only use sprayers that have good agitation. Ensure the sprayer is properly cleaned prior to adding PrePass.

1. Fill the sprayer tank 1/2 full with water.
2. Start the sprayer agitation and continue agitation throughout mixing and spraying procedure.
3. Add PrePass A herbicide to the spray tank followed by PrePass B herbicide. Complete the filling of the spray tank.

Sprayer cleanup:

1. Immediately after application, drain the sprayer.
2. Rinse the inside of the tank with clean water, and flush through the booms and hoses using at least 10% of the spray tank volume, and then drain spray tank completely.
3. Add 1 liter of household ammonia per 100 L of water while filling the tank with clean water. Agitate and then briefly flush the boom and hoses with the cleaning solution. Top up the tank with water and allow to stand 15 minuets with agitation. Flush boom and hoses, and drain the tank completely.
4. Remove nozzles and screens, and clean separately with ammonia solution (100 mL/10 L water).
5. Rinse the tank with clean water, and flush through the booms using at least 10% of the spray tank volume, and then drain the tank.

8. **Application Tips:** Warm, moist growing conditions promote active weed growth and enhance the activity of PrePass. Weeds hardened off by cold weather or drought stress may show delayed symptoms and result in reduced levels of control. Reduced control may occur when applied to weeds heavily covered in dust.
9. **How it Works:** PrePass A is taken up by leaves and stops growth of susceptible weeds rapidly via inhibition of the ALS enzyme. PrePass B is a non-selective systemic herbicide that moves through foliage into the roots, resulting in plant mortality.
10. **Expected Results:** Weeds susceptable to PrePass A will stop growing almost immediately. Newer leaves start to yellow and wilt, followed by a loss of green colour. Symptoms will spread to the rest of the plant with some weeds showing purpling or reddening. Under good growing conditions, complete control may occur within 7 - 10 days after application. Annual weeds susceptable to PrePass B will wilt and yellow within 2 - 4 days. Perennials will show similar symptoms within 5 - 10 days after application.
11. **Effects of Rainfall:** Heavy rainfall immediately after application may wash the chemical off the foliage, and a repeat application may be required. Do not apply if rainfall is forcast for time of application.
12. **Movement in Soil:** PrePass A is is somewhat soluble in water, but generally not mobile in soil under typical prairie conditions. Dissipation of PrePass A occurs primarily through microbial degradation. Field studies in a wide variety of soils have shown the half-life of PrePass A in soil to range from 2 - 18 days. The amount of PrePass B leaching is very low.
13. **Cropping Restrictions:**

    Drift: Do not allow spray mist to drift since drift can cause damage to non-target crops and plants. Do not apply when winds are gusty or in excess of 15 km/h. When spraying, avoid combinations of pressure and nozzle type that will result in fine particles (mist), which are more likely to drift.

    Succeeding crops:

    Pre-seed burn-down application: Fields treated with PrePass herbicide tank mix can be seeded to barley, oats or wheat in the year of application.

    Summerfallow application: Fields treated with PrePass herbicide tank mix can be seeded to barley, canola, durum wheat, peas, wheat or summerfallowed the year after treatment.

    Grazing restrictions: Do not graze treated areas within 7 days of application.
14. **Toxicity:** PrePass A has extremely low acute toxicity. Acute LD_{50} = >6,000 mg/kg. PrePass B has very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 4,320 mg/kg. Eye irritant.

PrePass (cont'd)

15. **Precautions, First Aid:** Do not get in eyes, on skin or on clothing. Wear impervious gloves, coveralls and chemical workers' goggles during the mixing and handling of PrePass. Wash thoroughly after handling. Wash contaminated clothes before reuse. Destroy contaminated shoes and leather articles.
16. **Storage:** Store away from food, feedstuff, fertilizer, seeds, insecticides and fungicides or other pesticides or herbicides. Store in dry, heated storage. If products are frozen, bring to room temperature and agitate before use. Soak up small amounts of spill with absorbent clays.
17. **Resistance Management:** PrePass is both a Group 2 and a Group 9 herbicide. Any weed population may contain or develop plants naturally resistant to PrePass and other Group 2 and 9 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Prestige *(fluroxypyr + clopyralid + MCPA Ester)*

Group 4

Manufacturer: Dow AgroSciences Canada Inc.

DANGER POISON

1. **Formulations:**

   Prestige A: Fluroxypyr, 180 g/L, 6.4 L jug.

   Prestige B: Clopyralid 50 g/L + MCPA Ester, 280 g/L, 2 x 8.0 L jugs.
2. **Registered Mixes:** Barley, spring wheat (excluding durum): Achieve Liquid (200 mL/ac) + Turbocharge adjuvant, Assert 300 SC (540 - 670 mL/ac) + acidulate, Puma^{120} Super (312 mL/ac for barnyard grass, green foxtail and wild oats). Spring wheat (excluding durum): Achieve 80DG (100 g/ac) + Turbocharge adjuvant, Everst 70 DF solupak (17.4 g/ac) + non-ionic surfactant, Horizon (95 mL/ac) + Score adjuvant, Puma^{120} Super (312 mL/ac for barnyard grass, green foxtail and wild oats).
3. **Crops:** Barley, tall fescue (established), wheat (spring wheat only).
4. **Weeds Controlled:**

annual sow-thistle (8.7)
Canada thistle (8.5)**
cleavers (1 - 4 whorls) (8.7)
common groundsel (8.9)
dandelion (8.0)*
flixweed*
kochia***
lamb's-quarters
perennial sow-thistle**
redroot pigweed (8.5)
round-leaved mallow (1 - 6 leaf) (8.6)
Russian pigweed
scentless chamomile
shepherd's-purse (9.0)
smartweed (8.4)
stork's-bill (1 - 8 leaf) (8.3)
stinkweed (8.9)
tartary buckwheat
volunteer canola (8.9)
volunteer flax (1 - 12 cm) (8.9)
volunteer sunflower
wild buckwheat (1 - 4 leaf) (8.7)
wild mustard (9.0)

* Spring rosettes only.
** Season-long control, with some regrowth in the fall (top growth control).
*** Including biotypes resistant to Group 2 herbicides that inhibit the ALS enzyme.

5. **Weeds Suppressed:** Common chickweed***, hemp-nettle (2 - 6 leaf stage) (8.3).

   *** Including biotypes resistant to Group 2 herbicides that inhibit the ALS enzyme.
6. **When Used:**

   Crop stage: Cereals: 3 leaf to just before flag leaf stage.

   Weed stage: Actively growing and in seedling stage stage.

7. **How to Apply**:

With: Ground equipment. Do not apply by air.

Rate: Always keep the same proportions of Prestige A and Prestige B when mixing less than a full tank.

Prestige A: 320 mL/ac.

Prestige B: 800 mL/ac.

Water volume: 40 L/ac.

Pressure: 200 - 270 kPa.

Nozzels: Flat fan type.

Mixing instructions: Use only sprayers with good agitation. Ensure that sprayer is properly cleaned prior to applying Prestige.

1. Fill the sprayer with half the required amount of clean water, start agitation and continue agitation throughout the mixing and spraying procedure.
2. Add required amount of Prestige A and then Prestige B.
3. Complete filling the sprayer tank.

8. **Application Tips**: Prestige is a non-residual herbicide and will only control emerged weeds. Prestige activity is infuenced by weather conditions. Optimum activity requires active weed growth. Temperature range for optimum activity is 12°C to 24°C. Reduced activity will occur when temperatures are below 8°C or above 27°C. Frost before application (3 days) or shortly after (3 days) may reduce weed control and crop tolerance. Weed control may be reduced during stress conditions, e.g. heat, drought or cold, or if weeds have initiated flowering or if heavy infestations exist. Wet foliage at time of application may result in reduced weed control. Optimum timing of application is 2 - 4 leaf stage of weeds. **Do not apply to wheat and barley underseeded to legumes.** Make only one application per year. Do not apply before 3 leaf stage or later than flag leaf stage of crop.

9. **How it Works**: Prestige herbicide tank mix does not control weeds that have not emerged at the time of application. The components of Prestige tank mix move within the plant to control exposed and underground plant tissue. The herbicide mimics naturally occurring plant hormones and controls weeds by disrupting normal plant growth patterns. Symptoms include twisting of stems and swollen nodes.

10. **Expected Results**: Weeds start to twist shortly after being sprayed. After twisting and bending, plants stop growing, turn brown and die. Difficult-to-control weeds such as Canada thistle and wild buckwheat stop growing, change colour to dark green and then turn yellow. Death may not occur for 14 - 21 days. Some weak Canada thistle regrowth may occur by the end of season

11. **Effects of Rainfall**: Do not apply if rain is expected within 6 hours.

12. **Movement in Soil**: Pestige A is bound tightly to soil organic matter but not readily bound to sand, silt or clay. Due to the relatively short half life of Prestige A, it rarely moves deeper than 15 cm in soil. Prestige B is made up of MCPA and clopyralid. MCPA is readily leached from soil. Clopyralid is somewhat soluble in water, but is generally not mobile in soil under typical prairie conditions.

13. **Cropping Restrictions**: Do not harvest the treated mature crop within 60 days after application.

Succeeding crops: Fields treated with Prestige herbicide tank mix can be seeded the following year to barley, canola, flax, forage grasses, mustard, oats, peas, rye, wheat or summerfallowed. Do not seed crops other than those listed above for at least one year after treatment.

Drift: Broadleaf crops are sensitive to spray drift. Minimize drift by using nozzles that put out sufficient spray volume and large droplets.

Grazing restrictions: Do not cut or graze fields of treated wheat or barley within 7 days after application.

Prestige (cont'd)

14. **Toxicity:**

    Prestige A: Very low mammalian toxicity. Acute oral LD_{50} (rats) = >2,000 mg/kg.

    Prestige B: Clopyralid: Very low acute mammalian toxicity. Acute LD_{50} (rats) = >2,000.
    MCPA: Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 700 - 800 mg/kg. May case burns upon contact with skin and eyes and can be absorbed through the skin.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a dry, heated area. If product is frozen, bring to room temperature and agitate before use.

17. **Resistance Management:** Prestige is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Prestige and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Prevail *(tralkoxydim + clopyralid + MCPA Ester)*

Group 1,4

Manufacturer: Dow AgroSciences Canada Inc.

CAUTION POISON

1. **Formulations:**
    1. Prevail A (tralkoxydim); dispersible granule: 80% 2 kg carton. Liquid: 400g/L, 4 L jug.
    2. Prevail B 50 g a.e./l clopyralid + 280 g a.e./L, MCPA Ester 2 x 8 L jug.
    3. Prevail C adjuvant 1 x 4 L jug.

2. **Registered Mixes:** None.

    Mixing instructions: Recommended mixing order: Prevail A from all cartons, Prevail B and then Prevail C.

3. **Crops:** Barley, durum wheat, spring wheat.

4. **Weeds Controlled:**

    annual sow-thistle
    Canada thistle* (8.0)
    common groundsel
    dandelion**
    flixweed**
    green foxtail (wild millet)
    lamb's-quarters (8.9)
    perennal sow-thistle (top growth)
    Persian darnel
    redroot pigweed
    Russian pigweed
    scentless chamomile (2 - 4 leaf)
    shepherd's-purse**
    smartweed (7.7)
    stinkweed** (9.0)
    tartary buckwheat
    volunteer rapeseed (8.9)
    wild buckwheat (8.6)
    wild mustard (8.6)
    wild oats (8.6)

    * Season-long control; with some re-growth in the fall.
    ** Spring rosettes only.

5. **Weeds Suppressed:** Kochia (2 - 4 leaf).

6. **When Used:**

    Crop stage: Cereals: 3 leaf to expanded 6 leaf stage of crop.

    Weed stage: Wild oats: 1 - 6 leaf stage of growth (up to emergence of third tiller). Green foxtail: 1 - 5 leaf stage of growth (up to emergence of second tiller). Broadleaf weeds: 1 - 4 leaf stage of growth. Canada thistle: 10 - 15 cm in height.

7. How to Apply:

With: Ground equipment only. With sprayers that can apply 40 L/ac spray solution because lower water volumes can cause mixing problems, and/or unacceptable crop injury can occur.

Rate: Always keep the same proportions of Prevail A, B and C (below) when mixing less than a full tank.

Prevail A: 100 g/ac (granule) or 200mL/ac (liquid).

Prevail B: 0.8 L/ac.

Prevail C: 0.5 L/100 L spray solution

Water volume: 40 L/ac.

Mixing instructions:

1. Only use sprayers with high agitation. Ensure the sprayer is properly cleaned prior to applying Prevail.
2. Add 3/4 required amount of water, start agitation and continue agitation throughout the entire mixing and spraying procedure. Do not enlarge the opening of the Prevail box. Remove strainer screen from filler opening of spray tank. Add Prevail slowly. Prevail A must be added directly into the sprayer through the tank opening and not through injector or hopper systems. For shallow spray tanks where water depth is 60 cm (24 inches) or less, add Prevail A towards agitator unit and away from outlet in the bottom of the tank to enhance dispersion. If more than one case of Prevail A is used, add Prevail A from all cases first prior to adding Prevail B and Prevail C.
3. Wait at least one minute after the last of the Prevail A has been added to the tank to allow for complete dispersion of the granules. A longer agitation period may be required to disperse Prevail A when using cold water (less than 5°C).
4. Add Prevail B and C.
5. Add remaining amount of water.
6. Always ensure the agitator is running until spraying is completed, even if stopping for brief periods. If agitation is stopped for more than 5 minutes, re-suspend spray solution by full agitation prior to respraying.

Note: Prevail must be sprayed within the same day of mixing.

Pressure: 275 kPa.

Nozzles: Flat fan type. 50 mesh or larger screens.

8. Application Tips: Do not apply if crop is under extreme drought stress or showing effects of excessive moisture. When grasses are stressed due to drought, heat, lack of fertility, flooding or prolonged cool temperature, control can be reduced or delayed since grasses are not actively growing. Apply to young actively growing weeds. Do not make applications to weeds stressed longer than 20 days due to lack of moisture or unsatisfactory control will result. Cereal crops exposed to temperatures below 5°C up to 48 hours before or after application may incur unacceptable injury. Unacceptable injury could also occur when application is made to crops under stress due to foliar diseases or lack of fertility. Allow a minimum of 7 days between application of Prevail and any other herbicide. Do not apply to wheat or barley which has been underseeded to forages or other companion crops. **Do not make more than one application of Prevail during the gowing season.**

9. How it Works: Tralkoxydim is translocated quickly after application to the growing points and youngest leaves. Weed growth stops almost immediately. First visible symptoms occur within a few days to 1 week, depending on the speed of growth of the plants, and appear in the form of yellowing. Clopyralid is a growth regulator type of herbicide, which is primarily absorbed through the foliage and is translocated to all parts of the plant causing leaves and stems to twist, yellow and then die. MCPA is a systemic herbicide for broadleaf weeds that is translocated throughout the plant causing rapid undifferentiated growth, which usually results in the death of susceptible weeds.

Prevail (cont'd)

10. **Expected Results:**

    Grassy weeds: Growth stops in 48 hours. Young shoots turn brown in 7 - 8 days. Complete death of plant will take 2 - 3 weeks.

    Broadleaf weeds: Weeds start to twist after spraying and after twisting and bending, plants turn brown and die.

    Difficult to control weeds such as Canada thistle and wild buckwheat stop growing, change colour to dark green and then turn yellow before they die. Death may not occur for 14 - 21 days after application. Some weak Canada thistle regrowth may occur by end of season.

11. **Effects of Rainfall:** Do not apply if rain is forecast within 6 hours.

12. **Movement in Soil:** Prevail A is not mobile in soil. MCPA is readily leached from soil. Clopyralid is somewhat soluble in water but is generally not mobile in soil under typical prairie conditions.

13. **Cropping Restrictions:** Do not harvest grain until 60 days after treatment with Prevail Herbicide tank mix.

    Succeeding crops: Fields treated with Prevail herbicide tank mix can be seeded the following year to barley, canola, corn, flax, forage grasses, mustard, oats, peas, rye, sugarbeets, wheat or summerfallowed. Do not seed crops other than those listed above for at least one year after treatment.

    Grazing restrictions: Do not graze or cut for feed immature crops treated with Prevail herbicide tank mix. Straw from treated fields may be used to feed to livestock. There is insufficient data to support such use. For more cropping and use information, contact your Dow AgroSciences Canada Inc. representative.

14. **Toxicity:**

    Tralkoxydim: Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 5,000 mg/kg. Treat symptomatically for ingestion and/or skin and eye contact. Avoid respiratory depressants unless otherwise indicated.

    Clopyralid: Very low acute mammalian toxicity. Acute oral LC_{50} (rats) = >2,000 mg/kg.
    Acute oral LD_{50} (bees) = >100 µg/bee. Extremely low toxicity to fish.

    MCPA: Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 700 - 880 mg/kg. Low toxicity to fish. May cause burns upon contact with skin and eyes, and it can be absorbed through the skin.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a cool, dry place. Keep packages dry at all times. If any component is frozen, bring up to room temperature and agitate.

17. **Resistance Management:** Prevail is both a Group 1 and a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Prevail and other Group 1 and 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Primextra II Magnum

(metolachlor + atrazine)

Group 15,5

Manufacturer: **Syngenta Crop Protection Canada Inc.**

1. **Formulations:** Flowable; 400 g/L S-metolachlor + 313 g/L atrazine + 7.0 g/L related active triazines; 1 x 14 L jug.
2. **Registered Mixes:** Nitrogen fertilizer solutions may replace all or part of the water carrier on preplant applications.
3. **Crops:** Field corn, silage corn, sweet corn.
4. **Weeds Controlled:**

   American nightshade
   annual smartweed
   barnyard grass
   crabgrass
   Eastern Black nightshade
   fall panicum
   green foxtail
   lady's-thumb
   lamb's-quarters
   prostrate pigweed
   purslane
   ragweed
   redroot pigweed
   wild buckwheat
   wild mustard
   witchgrass
   yellow foxtail
   yellow nutsedge

5. **Weeds Suppressed:** None.
6. **When Used:** Spring applied: pre-plant incorporated or banded. Pre-emergent (under irrigation only).
7. **How to Apply:**

   With: Ground equipment.

   Rate: 1.2 - 1.6 L/ac. Infestation Level: Light 1.2 L/ac; Medium 1.4 L/ac; Heavy 1.6 L/ac.

   Water volume: 60 - 120 L/ac.

   Pressure: 200 - 300 kPa.

   Nozzles: Use metal filters and screens 50 mesh or larger.

   Incorporation: Broadcast and lightly harrow before planting. Do not exceed 5 cm depth. Band treatment: mount a press wheel ahead of the nozzle to level the band.

8. **Application Tips:**
9. **How it Works:** Absorbed by roots and inhibits photosynthesis.
10. **Expected Results:** Weeds die at germination or under dry conditions, die-back soon after emergence.
11. **Effects of Rainfall:** Enhances results.
12. **Movement in Soil:** Some movement may occur if there is excess moisture on light soils.
13. **Cropping Restrictions:** Follow corn with corn only.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = atrazine 3,080 mg/kg, metolachlor = 2,780 mg/kg, Primextra = 4,680 mg/kg. May cause severe skin irritation and perhaps eye injury. Low toxicity to fish and birds. Intake may cause convulsions and coma.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

Primextra II Magnum (cont'd)

16. **Storage:** Dry heated storage preferred.
17. **Resistance Management:** Primextra II Magnum is both a Group 5 and a Group 15 herbicide. Any weed population may contain or develop plants naturally resistant to Primextra II Magnum and other Group 5 and 15 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Princep Nine-T *(simazine)*

Group 5

Manufacturer: **Syngenta Crop Protection Canada Inc.**

CAUTION POISON

1. **Formulations:** Water dispersible granule, Princep Nine-T; 89% simazine + 1% related triazines; 5 x 5 kg bag.
2. **Registered Mixes:** None.
3. **Crops:**

alfalfa (estab.) (8.5)*
apples
apricots
asparagus
bird's-foot trefoil (estab.)
blackberries
cherry
Christmas tree plantings
field corn
high bush blueberries
loganberries
low bush blueberries
nursery stock (estab.)*
peaches
pears
plums
raspberries
shelterbelts (estab.)*
sweet corn
woody ornamentals (estab.)
woodland tree plantings

* Established – at least 1 year old.

4. **Weeds Controlled:**

annual smartweeds
barnyard grass
crabgrass
lady's-thumb
lamb's-quarters
perennials (most seedling)
purslane
ragweed
volunteer clovers
wild buckwheat
wild oats
yellow foxtail

5. **Weeds Suppressed:** None.
6. **When Used:** Prior to weed emergence. May be applied in either the spring or fall, prior to freeze-up.

Alfalfa, bird's-foot trefoil: Late fall.

Asparagus, blueberries: Early spring.

Corn: Apply one week prior to seeding or within 4 days after seeding.

Raspberries: Early spring but not on young shoots.

Shelterbelts (established): Fall or in spring prior to weed emergence.

7. **How to Apply:**

With: Ground equipment.

Rate: (On established stands only: at least 1 year old)

Crop	Princep Nine-T
Alfalfa, bird's-foot trefoil	0.45 kg/ac
Asparagus, blackberries, high bush blueberries, nursery stock, woody ornamentals	1 - 1.5 kg/ac
Corn	0.6 - 1 kg/ac
Loganberries	1.5 - 2.4 kg/ac
Low bush blueberries	0.6 - 0.8 kg/ac
Non-bearing fruit trees (first year) apples, apricot, cherry, peach, pear, plum	0.45 - 0.9 kg/ac
Raspberries	0.8 - 1 kg/ac
Shelterbelts (1 year or older), Christmas tree, woodland plantations	2 - 2.8 kg/ac

Water volume: 120 L/ac. Shelterbelts: 200 L/ac.

Pressure: 275 kPa.

Nozzles: Use nozzle screens of 50 mesh or larger.

Incorporation: In corn, Princep may be applied 1 week before seeding and incorporated to a depth of 2.5 cm.

8. **Application Tips:** Gentle agitation required during mixing and spraying. After any break in the spray application, agitate thoroughly. Do not overlap application. Alfalfa, bird's-foot trefoil: Do not apply to the same field for more than 3 consecutive years. Do not apply Gramoxone within 1 year after the Princep application.
9. **How it Works:** Acts through the roots of germinating weeds and inhibit photosynthesis.
10. **Expected Results:** Weed-free ground.
11. **Effects of Rainfall:** Negligible.
12. **Movement in Soil:** Very little movement is possible on clay soil, but on sandy ground with high rainfall, some leaching may occur.
13. **Cropping Restrictions:**

Succeeding crops: Plant only corn in the treated area in the same year. Breakdown of simazine in the soil is slow and may cause injury to sensitive crops (e.g. cereals, canola, sugar beets, white beans, onions, peas, tomatoes, turnips) one or more years after application. The risk of damage to succeeding crops from simazine residues may be reduced by ploughing or deep tilling treated fields in the fall prior to seeding the next crop in the rotation. Spreading and incorporating manure may also help to reduce the simazine levels. Uneven application, excessive sprayer overlap or applications in excess of recommended rates will result in a longer carry-over of simazine residues. A prolonged period of hot dry weather will also lengthen the time that simazine residues remain in the soil.

Grazing restrictions: Allow 30 days between application and grazing of dairy, beef cattle, and sheep and 60 days between application and cutting for hay.

14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 5,000 mg/kg, Princep Nine-T = 5,000 mg/kg. May be irritating to eyes and cause dermatitis.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

Princep Nine-T (cont'd)

16. **Storage:** Store in dry area, heating not required.
17. **Resistance Management:** Princep Nine-T is a Group 5 herbicide. Any weed population may contain or develop plants naturally resistant to Princep Nine-T and other Group 5 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Prism *(rimsulfuron)*

Group 2

Manufacturer: **DuPont Canada Inc.**

CAUTION POISON

1. **Formulations:** Dry flowable; 25%; 480 g.
2. **Registered Mixes:** None.

   Surfactants: Citowett Plus, Agral 90 or Ag-Surf.
3. **Crops:** Potatoes (irrigated).
4. **Weeds Controlled:**

   barnyard grass
   fall panicum
   green foxtail
   quackgrass
   redroot pigweed
   witchgrass
   yellow foxtail
5. **Weeds Suppressed:** Lamb's-quarters.
6. **When Used:**

   Crop stage: Post-emergent, prior to the initiation of flowering.

   Weed stage: Annual grasses: 1 - 6 leaf stage, maximum 2 tillers. Quackgrass: 3 - 6 leaf stage (less than 10 inches leaf extended). Broadleaf weeds: 4 - 6 leaf stage. Apply to young, actively growing broadleaf weeds before the canopy closes. Weeds emerging after treatment may not be controlled.
7. **How to Apply:**

   With: Ground equipment. Do not apply by air.

   Rate: 24 g/ac plus plus 2 L of surfactant per 1,000 liters of spray solution.

   Water volume: 40 L/ac.

   Pressure: 175 - 275 kPa.

   Nozzles: Use flat fan nozzles. Use 50 mesh screens or larger.

   Mixing instructions:

   1. Ensure that the spray tank, lines and filter are thoroughly clean.
   2. Fill the spray tank with one quarter required amount of clean water and start agitation or bypass system.
   3. Add the required amount of Prism while maintaining agitation.
   4. After Prism herbicide has been well mixed and is completely in suspension, add recommended non-ionic surfactant.
   5. Fill the remainder of the spray tank with water.
   6. On repeat tank loads, ensure that the amount of spray solution left in the spray tank from the previous load is less than 10% of the volume to be mixed.
   7. Use spray preparation within 24 hours or product degradation may occur, resulting in loss of weed control. Use vigorous agitation to thoroughly disperse spray mixtures that have been allowed to stand in the tank.
   8. **Do not** tank mix with any other chemical additives, pesticides or fertilizers.

Sprayer cleanup: To avoid injury to susceptible crops, thoroughly clean sprayer immediately after spraying. Ammonia must be used to deactivate Prism when cleaning.

1. Drain and flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to ensure removal of all visible residues of Prism. If necessary, repeat step 1.
2. Fill tank with clean water while adding 1 litre of 3% ammonia per 100 litres of water. Flush solution through boom and hoses, then add more water and ammonia to completely fill tank so that all surfaces are in contact with the solution. Allow to sit for 15 minutes with agitation. Again, flush the hoses, booms and nozzles with the cleaning solution and drain the tank.
3. Remove nozzles and screens, and clean separately in bucket containing cleaning agent and water.
4. Repeat step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips:** During periods of stress, plants are not actively growing. When daytime temperatures, before or following application, are very hot combined with very dry conditions and low humidity, plants are under stress. Application of Prism during these periods may result in substantially reduced control. Do not apply to crop that is stressed by severe weather conditions, frost, low fertility, drought, water saturated soil, disease or insect damage as crop injury may result.
9. **How it Works:** Prism is absorbed through the foliage and inhibits cell elongation.
10. **Expected Results:** Rapid cessation of weed growth; initial development of leaf chlorosis within 5 - 7 days after application. Discolouration of dying weeds may not be noticeable for 2 - 3 weeks after application, depending on growing conditions and weed susceptibility. Application to potatoes may result in temporary foliar symptoms (discolouration of younger leaves and pinching of the terminal leaf) that may be confused with symptoms of a viral disease. Early application timing may reduce the likelihood of foliar symptoms.

    Poor results may be expected if improper mixing, timing, coverage or when weeds are under stress.
11. **Effects of Rainfall:** Rainfall within 2 - 4 hours of application may lessen degree of weed control.
12. **Movement in Soil:** The soil mobility of Prism and its degradation products are negligible. Prism degrades rapidly in soil, regardless of soil type.
13. **Cropping Restrictions:** Pre-harvest interval: 30 days. Make only one application per year.

    Minimum crop rotation guidelines: The minimum interval is the time from the last application of Prism to the date of planting the rotational crop.

    Interval prior to planting (months after application):

    4 months: winter wheat.

    10 months: barley, soybeans, white beans, red clover, sorghum, potatoes, field corn. All other crops, field bioassay.

    Grazing restrictions: Do not graze the treated crops or cut for hay; sufficient data is not available to support such use.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) is >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry, well ventilated room.
17. **Resistance Management:** Prism is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Prism and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Puma^{120} Super *(fenoxaprop-p-ethyl)*

Group 1

Manufacturer: **Bayer CropScience**

CAUTION POISON

1. **Formulations:** Emulsifiable concentrate; 120 g/L; 2 x 6.2 L container or 99.3 L pod container.
2. **Registered Mixes:** See tables.

Weed Control in Spring Barley

		Puma^{120} Super (rate)	
Tank mix partner	**Tank mix partner (rate)**	**Barnyard grass, green foxtail, wild oats, yellow foxtail**	**Green foxtail only**
2,4-D Ester 600	283 mL/ac	312 mL/ac	156 mL/ac
2,4-D Ester LV 700	243 mL/ac	312 mL/ac	156 mL/ac
Ally	2.0 - 3.0 g/ac	312 mL/ac	156 mL/ac
Buctril M	405 mL/ac	312 mL/ac	156 mL/ac
Curtail M	607 - 810 mL/ac	312 mL/ac	156 mL/ac
Dichlorprop D	709 mL/ac	312 mL/ac	156 mL/ac
DyVel	506 mL/ac	No	156 mL/ac
Estaprop	709 mL/ac	312 mL/ac	156 mL/ac
Express Pack (Express + 2,4-D LV 700)	4 g/ac + 243 mL/ac	No	156 mL/ac
MCPA Amine 500	340 mL/ac	312 mL/ac	156 mL/ac
MCPA Ester 500	340 mL/ac	312 mL/ac	156 mL/ac
Prestige (Prestige A + Prestige B)	324 mL/ac + 810 mL/ac	312 mL/ac	156 mL/ac
Refine Extra	8.1 g/ac	312 mL/ac	156 mL/ac
Refine Extra + Adapt	8.1 g/ac + 1% v/v	312 mL/ac	156 mL/ac
Refine Extra + Buctril M	2.7 g/ac + 400 mL/ac	312 mL/ac	156 mL/ac
Refine Extra + MCPA Ester 500	8.1 g/ac + 340 mL/ac	312 mL/ac	156 mL/ac
Use only MCPA Ester 500 in this tank mix and only at recommended rates. Failure to do so may result in reduced wild oat control. **DO NOT USE MCPA Amine.**			
Thumper	405 mL/ac	312 mL/ac	156 mL/ac
Trophy Trophy A + Trophy B	243 mL/ac + 453 mL/ac	312 mL/ac	No
Unity Unity 280EC + Unity 75WG	202 mL/ac + 4.3 g/ac	312 mL/ac	156 mL/ac

Weed Control in Durum and Spring Wheat

Tank mix partner	**Tank mix partner (rate)**	**Puma^{120} Super (rate)** **Barnyard grass, green foxtail, wild oats**	**Green foxtail only**
2,4-D Ester 600	283 mL/ac	312 mL/ac	156 mL/ac
2,4-D Ester LV 700	243 mL/ac	312 mL/ac	156 mL/ac
Ally	2.0 - 3.0 g/ac	312 mL/ac	156 mL/ac
Attain	For use on spring wheat only. Do not apply on durum wheat.		
(Attain A + Attain B)	243 mL/ac + 405 mL/ac	312 mL/ac	156 mL/ac
Buctril M	405 mL/ac	312 mL/ac	156 mL/ac
Curtail M	810 mL/ac	312 mL/ac	156 mL/ac
Dichlorprop D	708 mL/ac	312 mL/ac	156 mL/ac
DyVel	507 mL/ac	No	156 mL/ac
DyVel DS	445 mL/ac	No	156 mL/ac
Estaprop	710 mL/ac	312 mL/ac	156 mL/ac
Express Pack			
(Express + 2,4-D LV 700)	4.0 g/ac + 243 mL/ac	No	156 mL/ac
Lontrel 360	170 mL/ac	312 mL/ac	156 mL/ac
Lontrel 360 + MCPA Ester 500	170 mL/ac + 340 mL/ac **or**	312 mL/ac	No
	113 mL/ac + 340 - 453 mL/ac	312 mL/ac	No
Use only MCPA Ester 500 in this tank mix and only at recommended rates. Failure to do so may result in reduced wild oat control. **DO NOT USE MCPA Amine.**			
MCPA Amine 500	340 mL/ac	312 mL/ac	156 mL/ac
MCPA Ester 500	340 mL/ac	312 mL/ac	156 mL/ac
Mecoprop (150 g active per litre)	2.2 - 2.8 L/ac	312 mL/ac	No
Note: A reduction in wild oat control may be observed when Puma^{120} Super is applied in a tank mixture with Mecoprop.			
Prestige	For use on spring wheat only. Do not apply on durum wheat.		
(Prestige A + Prestige B)	324 mL/ac + 810 mL/ac	312 mL/ac	156 mL/ac
Refine Extra	8.1 g/ac	312 mL/ac	156 mL/ac
Refine Extra + Buctril M	2.7 g/ac + 400 mL/ac	312 mL/ac	156 mL/ac
Refine Extra + MCPA Ester 500	8.1 g/ac + 340 mL/ac	312 mL/ac	156 mL/ac
Use only MCPA Ester 500 in this tank mix and only at recommended rates. Failure to do so may result in reduced wild oat control. **DO NOT USE MCPA Amine.**			
Thumper	405 mL/ac	312 mL/ac	156 mL/ac
Trophy			
Trophy A + Trophy B	243 mL/ac + 453 mL/ac	312 mL/ac	No
Unity			
Unity 280EC + Unity 75WG	202 mL/ac + 4.33 g/ac	312 mL/ac	156 mL/ac

3. **Crops:** Barley, durum wheat, all spring wheats.
4. **Weeds Controlled:** Barnyard grass, green foxtail, wild oats, yellow foxtail.
5. **Weeds Suppressed:** None.

Puma^{120} Super (cont'd)

6. When Used:

Crop	Recommended stage
Barley	1 - 5 leaves on main stem plus 2 tillers (Zadoks 11-15,22)
Durum wheat, spring wheat	1 - 6 leaves on main stem plus 3 tillers (Zadoks 11-16,23)

Do not apply Puma^{120} Super alone in barley. Always tank mix with a recommended broadleaf weed partner.

Weed stage: Annual grassy weeds: Wild oats, green foxtail, yellow foxtail and barnyard grass: 1 - 6 leaf stage up to emergence of the third tiller. Plants must be actively growing. Weeds that emerge after application will not be controlled.

Broadleaf weeds: When tank mixing with a broadleaf weed herbicide, consult the appropriate label for proper timing of application, weeds controlled and any possible recropping restrictions.

7. How to Apply:

With: Ground equipment, aircraft.

Rate: 312 mL/ac. Under low wild oat infestations and when applying Puma^{120} Super alone in wheat: 270 mL/ac. Green foxtail control only: 156 mL/ac.

Water volume: Ground: 22.5 - 45 L/ac in barley and wheat. Air: 13.5 L/ac or more.

Pressure: Ground: 275 kPa; Air: no less than 300 kPa.

Nozzles: Only 110° or 80° flat fan nozzles are recommended. Uniform, thorough coverage is important for good control.

Mixing instructions:

1. Ensure that the spray tank is thoroughly clean.
2. Fill the tank half full with clean water and start agitation or bypass system.
3. If a broadleaf herbicide is to be tank mixed, add the broadleaf herbicide **first** prior to adding Puma^{120} Super.
4. Slowly add the correct amount of Puma^{120} Super to the spray tank. Agitate thoroughly.
5. Triple rinse the emptied containers into the spray tank.
6. Add the remaining amount of water while agitation continues. Spray out immediately. Spray mixture should not be left in the tank overnight.
7. When mixing second and subsequent tankfuls, ensure that the tank is half-full of clean water prior to adding herbicide, and follow steps 2 - 6.
8. Thoroughly clean the spray tank by flushing with a water/detergent mixture after using Puma^{120} Super or before using any other pesticide.

8. Application Tips:

A time interval of 7 days prior to application or 4 days after application of Puma^{120} Super is required before any other pesticide can be applied, except for those recommended on the label. During periods of stress, plants are not actively growing. When daytime temperatures before and after application are very hot and are combined with very dry conditions and low humidity, plants are under stress. Application of Puma^{120} Super during these periods may result in substantially reduced control. Application of the spray at a forward angle of 45° will result in better penetration of the canopy and better coverage. Do not apply to crop stressed by severe weather conditions, frost, low fertility, drought, water saturated soil, disease or insect damage as crop injury may result.

9. How it Works:

Fenoxaprop-p-ethyl: Contact as well as systemic, no soil activity. Regions of high meristematic activity, such as root and shoot tips, are known to be affected.

10. Expected Results:

Grassy weeds: Reduction of leaf growth and chlorotic blotching within 1 - 3 days after application. Initial development of leaf chlorosis within 5 - 8 days after application and complete death within 14 - 21 days after application.

11. Effects of Rainfall:

Do not apply if rain is expected within 1 hour of application.

12. **Movement in Soil:** Fenoxaprop-p-ethyl appears to undergo rapid hydrolysis in the soil.
13. **Cropping Restrictions:** Observe a minimum of 25 days before grazing livestock on crops treated with Puma^{120} Super.

    Pre-harvest interval: 65 days.
14. **Toxicity:** Acute oral LD_{50} (rats) = 3,735 mg/kg.
15. **Precautions, First Aid:** May cause eye damage. Causes eye and skin irritation. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention. **Do not re-enter treated areas within 12 hours of application.**
16. **Storage:** Keep away from fire or open flame or other sources of heat. Cannot be stored below freezing. If stored for 1 year or longer, shake well before using. Store the tightly closed containers away from seeds, fertilizer, plants and foodstuffs. Do not use or store in or around the home. Keep in original container during storage.
17. **Resistance Management:** Puma^{120} Super is a Group 1 herbicide. Any weed population may contain or develop plants naturally resistant to Puma^{120} Super and other Group 1 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Pursuit *(imazethapyr)*

Group 2

Manufacturer: BASF Canada

1. **Formulations:** Aqueous solution; 240 g/L; 3.3 L container.
2. **Registered Mixes:**

    CLEARFIELD canola: Poast Ultra.

    Field peas: Poast Ultra, at 190 mL/ac + Merge at 1 L/100 L water volume.

    Seed alfalfa (seedling and established) and dry beans: None.

    Surfactants: Pursuit alone:

    Non-ionic surfactant (minimum of 80% active ingredient) such as Ag-Surf or Agral 90 or Surf 92 (added at the rate of 0.25% of the water volume).

    Tank mixes: With Poast Ultra, add Merge at 1 L/100 L water volume; Check Poast Ultra, Select and Venture label for recommendations.

    Mixing instructions: For Pursuit alone: Fill sprayer tank with 1/2 the required amount of water. Add the required amount of Pursuit herbicide while agitating, followed by the required amount of surfactant. Add remainder of water. For tank mixes, check Poast Ultra, Select and Venture label for recommendations.

    Mixing rates: See Poast Ultra for tank mixing rates.
3. **Crops:** Chickling vetch/green peas, CLEARFIELD canola, field peas*, pink dry beans*, pinto dry beans, red dry beans, seed alfalfa (seedling and established).

    * Black, Grey Wooded and irrigated Brown soil zones only.

Pursuit (cont'd)

4. **Weeds Controlled**:

Chickling vetch/green pea, CLEARFIELD canola, peas: Chickweed, cleavers, green foxtail, hemp-nettle, redroot pigweed, shepherd's-purse, smartweed, stinkweed, volunteer canola (except CLEARFIELD canola), wild buckwheat, wild mustard, wild oats.

Dry beans: Hairy nightshade.

Established alfalfa (seed): Redroot pigweed, stinkweed, wild mustard, volunteer canola.

Seedling alfalfa (seed): Redroot pigweed, smartweed, stinkweed, volunteer canola, wild mustard.

5. **Weeds Suppressed:** Chickling vetch/green pea. CLEARFIELD canola: lamb's-quarters, volunteer barley, volunteer wheat. Established alfalfa: green foxtail. Peas: lamb's-quarters. Seedling alfalfa: lamb's-quarters, common groundsel, shepherd's-purse, green foxtail.

6. **When Used**:

Crop stage: CLEARFIELD canola: 1 - 4 leaf stage. Field peas: up to and including the 6th node stage. Established alfalfa (for seed production only): 1 - 4 trifoliate leaf stage of alfalfa; apply before alfalfa reaches 30 cm in height. Seedling alfalfa, apply only in the year of establishment and only one application of Pursuit during the life of the alfalfa stand, on stands that will remain for 3 years or more. In established alfalfa stands used for seed production only, do not make more than one application per year and do not apply in the last year of the alfalfa stand. Chickling vetch/green pea: 5 - 7 leaf stage. Dry beans: Up to and including the second trifoliate.

Weed stage: Apply early post-emergence, up to the 4 true leaf stage of actively growing weeds. Wild oats: 2 - 4 leaf stage. Hairy nightshade: up to 6 leaf stage.

7. **How to Apply**:

With: Ground equipment only.

Rate: 85 mL/ac.

Surfactant: 1 L non-ionic surfactant/400 litres of spray solution when using Pursuit alone.

Water volume: 40 - 160 L/ac.

Pressure: 275 kPa.

Nozzles: Flat fan recommended; tilted 45° forward for better penetration. 50-mesh screens and filters.

Incorporation: Not applicable.

8. **Application Tips:** Do not spray if freezing temperatures are forecast.

9. **How it Works:** Absorbed by foliage and roots. Disrupts plant metabolism causing growth to stop. Works best under good growing conditions.

10. **Expected Results:** Susceptible weeds stop growing within 24 - 48 hours. Yellow striping and purplish or reddish discolouration of the leaves may occur. Leaves begin to die in 3 - 10 days starting with the youngest and moving to the older leaves. Death of the plant may occur in 1 - 3 weeks.

11. **Effects of Rainfall:** Rainfall within 6 hours of application may reduce activity.

12. **Movement in Soil:** Is not leached appreciably.

13. **Cropping Restrictions:** Only one application of Pursuit may be made during the season.

Field peas: May be fed to livestock 30 days after application.

CLEARFIELD canola: Do not graze or cut for hay, insufficient data to support such use.

Alfalfa: May be grazed or harvested for forage 14 days after application.

Miniumum interval to harvest: Field peas: 60 days; CLEARFIELD canola 70 days; dry beans: 75 days; chickling vetch/green pea: 60 days.

Succeeding crops:

Black, Grey Wooded and Irrigated Brown soil zones: Spring wheat, CLEARFIELD canola, field peas, lentils and alfalfa may be planted the season following a Pursuit application. Barley may be planted in the black and grey wooded soil zones the season following application. Non-CLEARFIELD canola can be grown in the third year after Pursuit application (e.g. if you used Pursuit in 2001, you can grow conventional canola in 2004). Perform a bioassay on other crops prior to planting them on a field-scale. In case of crop failure, replant only to CLEARFIELD canola or field peas the year of application.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) 5,000 mg/kg. Non-toxic to fish, birds and bees.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store at temperatures above 0°C. If product is exposed to temperatures below 0°C during shipment or storage, make sure the product has thawed completely and shake container vigorously.

17. **Resistance Management:** Pursuit is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Pursuit and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Pursuit Ultra *(sethoxydim + imazethapyr)*

Group 1,2

Manufacturer: BASF Canada

1. **Formulations:** Poast Ultra – 450 g/L emulsifiable concentrate; 7.7 L; Pursuit – 240 g/L liquid; 1.65 L; Merge – 2 x 8.1 L jugs.
2. **Registered Mixes:** None.
3. **Crops:** CLEARFIELD canola, field peas.
4. **Weeds Controlled:**

barnyard grass
chickweed
cleavers
green foxtail
hemp-nettle*
Persian darnel
proso millet
redroot pigweed*
smartweed
stinkweed
volunteer barley
volunteer canola (non-CLEARFIELD varieties)
volunteer corn
volunteer wheat
wild buckwheat**
wild mustard
wild oat
witchgrass
yellow foxtail

* Field peas only.
** Light infestations.

5. **Weeds Suppressed:** Quackgrass.
6. **When Used:**

Crop stage: CLEARFIELD canola: After the 1 leaf stage. Field peas: Up to the 6th above ground node stage (6 true leaves).

Weed stage: Grassy weeds: 1 to 6 leaf stage. Broadleaf weeds: Up to 4 leaf stage.

Pursuit Ultra (cont'd)

7. **How to Apply:**

   With: Ground equipment only.

   Rate: Poast Ultra – 0.19 L/ac; Pursuit – 0.04 L/ac.

   Surfactant: Add Merge at 0.4 L/ac in a water volume of 10 gal/ac (45 L/ac).

   Water volume: 45 L/ac.

   Pressure: 275 kPa (40 psi).

   Nozzles: Flat fan nozzles tilted forward at a 45° angle.

8. **Application Tips:** Do not spray if freezing temperatures are forecast. Treat when weeds are actively growing, there is good soil moisture and crop is small enough to permit thorough coverage. Do not apply on weeds stressed longer than 20 days due to lack of moisture as unsatisfactory control may result. Reduced weed control may result if applied when weeds are stressed by hot, cold, dry or wet conditions. Control of grass weeds may be reduced if temperatures are below 15°C. Prior to using Pursuit Ultra, ensure that the sprayer has been cleaned according to the previous product manufacturer's specifications or sprayer clean-out recommendations.

9. **How it Works:** Poast Ultra is a systemic and a contact herbicide. It is absorbed through foliage and plant roots and is translocated to growing points where it disrupts the plant metabolism causing growth to stop.

10. **Expected Results:** Susceptible weeds stop growing within 24 - 48 hours. Yellow striping and purplish or reddish discolouration of the leaves may occur. Leaves begin to die in 3 - 10 days, starting with the youngest and moving to the older leaves. Death of the plant may occur in 1 - 3 weeks. Susceptible grasses stop growing immediately, gradually turn yellow and then brown. The time required for complete control is normally 7 - 21 days (annual grasses). Control of quackgrass develops more slowly than control of annual grasses. Pursuit Ultra is translocated through the quackgrass plant to the rhizomes and kills actively growing rhizome buds, as well as above ground vegetation. Dormant rhizome buds will remain unaffected by the spray, and regrowth can occur from these buds. The regrowth will not be significant until 6 - 8 weeks after treatment, depending on growing conditions, crop cultivation practices and crop competition.

11. **Effects of Rainfall:** Rainfall within 1 hour of applying Poast Ultra may reduce grass weed control. For Pursuit, rainfall within 6 hours may reduce activity. Contact manufacturer for more information.

12. **Movement in Soil:** Poast Ultra: relatively immobile, breaks down rapidly in soil. Pursuit: is not leached appreciably.

13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze treated area prior to maturity.

    Recropping interval: Rotate to barley, spring wheat (not durum), lentils, alfalfa, field peas or CLEARFIELD canola the year following application. Conduct a field bioassay (a test strip grown to maturity) the year before growing any crop other than those listed above. Non-CLEARFIELD canola can be grown in the third year after Pursuit Ultra application (e.g. if you used Pursuit Ultra in 2000, you can grow conventional canola in 2003). In case of crop failure, only field peas or CLEARFIELD canola may be re-planted in the year of application. **Note: Do not use in the Brown or Dark brown Soil zones as rotational crops may be severely injured due to carryover in these soils. Do not apply Pursuit to the same field two years in a row.**

14. **Toxicity:** Sethoxydim: Low acute mammalian toxicity. Acute oral LD_{50} (rats) = formulation 2,500 mg/kg. Causes moderate skin and eye irritation. Low toxicity to birds, fish and bees. Hazards to the environment are low because of rapid breakdown in soil. Imazethapyr: Low acute mammalian toxicity.
    Acute oral LD_{50} (rats) = 5,000 mg/kg. Non-toxic to fish, birds and bees.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** May be stored at freezing temperatures. Warm to room temperature and agitate before use.
17. **Resistance Management:** Pursuit Ultra is both a Group 1 and a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Pursuit Ultra and other Group 1 and 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Pyramin *(pyrazon)*

Manufacturer: BASF Canada

Group 5

CAUTION POISON

1. **Formulations:** Flowable formulation 430 g/L; 3 L jugs.
2. **Registered Mixes:** Avadex BW, TCA or Ro-Neet, Nortron SC.

   Surfactants: Super Spreader.
3. **Crops:** Sugar beets.
4. **Weeds Controlled:**

   black nightshade
   chickweed
   knotweed
   lady's-thumb
   lamb's-quarters
   oak-leaved goosefoot
   prostrate pigweed
   purslane
   ragweed
   redroot pigweed
   shepherd's-purse
   smartweed
   stinkweed
   wild buckwheat
   wild carrot
   wild mustard
   wormseed mustard
   yellow rocket
5. **Weeds Suppressed:** None.
6. **When Used:** Pyramin may be used as a pre-plant incorporated, pre-emergent or post-emergent treatment. Post-emergent treatments should be applied before the weeds have 3 leaves.
7. **How to Apply:**

   With: Ground equipment.

   Rate: Light soils: 3.3 L/ac. Heavy soils: 4.1 L/ac. Nortron tank mix – Pyramin: 2.12 L/ac + Nortron SC: 1.48 L/ac.

   Water volume: 40 - 101 L/ac.

   Pressure: 275 - 350 kPa.

   Nozzles: All standard low pressure nozzles delivering 40 - 101 L/ac.

   Incorporation: Pre-plant – incorporate shallow. Fall ridging – apply Pyramin in a 17.5 cm band and cover with a 15 - 20 cm high ridge of soil. In the spring, level the ridges and leave guide marks to enable planting the bands. Avoid levelling deeper than the chemical placement.
8. **Application Tips:** Pyramin must not be mixed into soil deeper than seed is planted to reduce beet injury.
9. **How it Works:** The active ingredient in Pyramin is absorbed by the roots and is translocated to the leaves.
10. **Expected Results:**

    Weeds: If adequate moisture is present, the weeds will fail to emerge. If the soil is dry for a long time, weeds that emerge and become well established will not be fully controlled, but small emerged weeds may die back, once adequate moisture is present.
11. **Effects of Rainfall:** No effect.
12. **Movement in Soil:** Pyramin does not move readily in the soil and cannot be leached out.

Pyramin (cont'd)

13. **Cropping Restrictions:** None.

    Drift: Care should be taken to avoid drift onto sensitive plants such as rapeseed and mustard.

    Grazing restrictions: The tops of beets grown in Pyramin treated soil may be used for human consumption or fed to livestock.

14. **Toxicity:** Very low acute mammalian toxicity. Oral LD$_{50}$ (rats) = 3,030 mg/kg. No short term or long term human health problems are associated with this product when used according to label. Non-toxic to bees.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention

16. **Storage:** Store in a cool, dry place. Do not store below 0°C.

Refine Extra *(thifensulfuron methyl + tribenuron methyl)*

Group 2

Manufacturer: **DuPont Canada Inc.**

CAUTION POISON

1. **Formulations:** Dry flowable; 50% thifensulfuron methyl, 25% tribenuron methyl; Toss-N-Go 320 g (4 x 80 g) water soluble pouches.

2. **Registered Mixes:** Curtail M (600 mL/ac + surfactant); Lontrel (85 mL/ac) + surfactant; Lontrel + MCPA (83 mL/ac Lontrel + 336 mL/ac MCPA Ester 500) + surfactant; Lontrel + 2,4-D (83 mL/ac Lontrel + 336 mL/ac 2,4-D Amine 500 or 240 mL/ac 2,4-D Ester LV 700) + surfactant; Accord (55 - 67 g/ac + Merge 1.0 L/100 L spray volume); Accord + Avenge 200-C (55 - 67 g/ac + 1.4 L/ac + Merge 1.0 L/100 L spray volume); MCPA (280 - 445 mL/ac Amine or Ester 500 + surfactant); 2,4-D (340 - 445 mL/ac Amine 500 + surfactant; 280 - 365 mL/ac Ester 600 + surfactant; not for use on oats). *Assert, *Assert + MCPA Ester, *Avenge, Horizon + Score surfactant (see Horizon label for mixing instructions), Puma^{120} Super (312 mL/ac or 156 mL/ac on green foxtail only); Attain (121 mL/ac of fluroxypyr + 225 mL/ac 2,4-D Ester).

    * Do not use surfactant when tank mixing with grass herbicide unless specified on grass herbicide label.

    Surfactants: Agral 90, Ag-Surf, Citowett Plus, Curtail M, Lontrel, Super Spreader. Use a surfactant when Refine Extra is used alone or in a mixture with MCPA or 2,4-D.

3. **Crops:** Barley, durum wheat, oats, spring wheat, winter wheat.

    Seedling or established grasses for forage or seed production

    creeping red fescue
    crested wheatgrass
    intermediate wheatgrass
    Kentucky bluegrass (established)
    meadow bromegrass
    northern wheatgrass
    orchard grass
    pubescent wheatgrass
    slender wheatgrass
    smooth bromegrass
    streambank wheatgrass
    tall fescue (seedling only)
    tall wheatgrass
    western wheatgrass

    Underseeding: Do not apply to crops underseeded to legumes or grasses.

4. Weeds Controlled:

Refine Extra 8 g/ac alone

- ball mustard
- chickweed (8.5)
- common groundsel
- corn spurry (8.8)
- cow cockle (8.7)
- flixweed
- green smartweed
- hemp-nettle (8.4)
- kochia (7.7)
- lady's-thumb
- lamb's-quarters (8.6)
- narrow-leaved hawk's-beard
- redroot pigweed (8.4)
- Russian thistle (7.9)
- shepherd's-purse (8.2)
- stinkweed (8.6)
- tartary buckwheat (8.3)
- volunteer rapeseed (excluding smart-trait) (8.6)
- volunteer sunflower
- wild buckwheat (7.7)
- wild mustard (8.6)

Refine Extra 8 g/ac + MCPA or 2,4-D

- ball mustard
- burdocks (seedling)
- chickweed (8.8)
- cocklebur*
- common groundsel
- common plantain
- corn spurry
- cow cockle
- false ragweed*
- flixweed
- giant ragweed*
- green smartweed
- hare's-ear mustard
- hemp-nettle (8.2)
- Indian mustard
- kochia*
- lady's-thumb
- lamb's-quarters (8.7)
- narrow-leaved hawk's-beard
- prickly lettuce
- ragweed* (8.3)
- redroot pigweed* (8.7)
- Russian pigweed*
- Russian thistle
- shepherd's-purse (7.9)
- stinkweed (8.6)
- stork's-bill (2 - 6 leaf) (8.2) (2,4-D Ester only)
- sweet clover**
- tartary buckwheat
- tumble mustard
- volunteer rapeseed (including smart-trait)
- volunteer sunflower
- wild buckwheat (7.7)
- wild mustard
- wild radish
- wormseed mustard

* Use a minimum of 320 mL/ac of MCPA Amine 500.

** Refine Extra + 2,4-D only.

5. Weeds Suppressed: Canada thistle (7.1), cleavers (6.7), round-leaved mallow (6.4), scentless chamomile (6.9), sow-thistle, stork's-bill (6.7), toadflax (less than 15 cm tall) (7.1).

6. When Used:

Crop stage: Refine Extra alone: Barley, oats, spring wheat (including durum), winter wheat: 2 leaf – flag leaf stage.

Refine Extra + MCPA: Barley, oats, wheat: Full 3 leaf to expanded shot blade.

Refine Extra + 2,4-D: Barley and wheat: Full 3 leaf to expanded shot blade.

Refine Extra + Accord: Spring wheat, including durum: 2 - 5 leaf stage.

Weed stage: Apply to young, actively growing weeds before the canopy closes. Weeds emerging after treatment may not be controlled. Wild buckwheat: 1 - 3 leaf stage and actively growing. Apply Refine Extra + Curtail M + surfactant to actively growing wild buckwheat in the cotyledon to 5 leaf stage. Cleavers: 1 - 3 whorl stage. Canada thistle, sow-thistle: Apply when the majority of the thistles have emerged and are actively growing. For best top growth control, apply when thistles are no larger than 15 cm tall, before bud stage and before crop canopy prevents thorough coverage of the thistles. A single application will effectively inhibit the ability of emerged thistles to compete with the crop. Later emerging thistle will not be controlled. Apply Refine Extra + Curtail M + surfactant post-emergent when the majority of the thistles have emerged and are actively growing. For best control, apply when thistles are no larger than 15 cm tall, before the bud stage and before crop canopy prevents thorough coverage of the thistles. Later emerging thistles will not be controlled. Chickweed: Apply when the chickweed is small (1 - 6 leaf) and actively growing, but before crop canopy prevents thorough coverage of weeds. Chickweed emerging after application will not be controlled. Round-leaved mallow: Apply to actively growing round-leaved mallow in the 2 - 6 leaf stage (10 - 12 cm in height). Refine Extra will keep mallow stunted but may not reduce the overall populations. Toadflax: Apply when toadflax is no taller than 15 cm in height. A control program for this weed includes both frequent tillage and chemical application.

7. How to Apply:

With: Ground equipment. Do not apply by air.

Rate: Barley, wheat (spring, winter, durum), oats: Refine Extra 8 g/ac.

Surfactant: 2 L/1,000 L of spray solution.

Water volume: 22 L/ac (minimum).

Refine Extra (cont'd)

Pressure: 275 kPa.

Nozzles: Flat fan type. Use 50 mesh of larger screens. Use only metal or nylon filters.

Sprayer cleanup: To avoid injury to susceptible crops, clean sprayer thoroughly immediately after spraying. Ammonia must be used to deactivate Refine Extra when cleaning.

1. Drain and flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to ensure removal of all visible residues of Refine Extra. If necessary, repeat step 1.
2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water and ammonia to completely fill tank so that all surfaces are in contact with the solution. Allow to sit for 15 minutes **with agitation**. Again, flush the hoses, boom and nozzles with the cleaning solution and drain tank.
3. Nozzles and screens should be removed and cleaned seperately in a bucket containing cleaning agent and water.
4. Repeat step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips:** Higher spray volumes are required for dense crop canopy and/or large weeds. Weeds should be less than 10 cm tall or across at application. Effectiveness of Refine Extra may be reduced if it remains in the tank for more than 24 hours. Use Assert tank mixes within 12 hours.
9. **How it Works:** Absorbed through foliage. Inhibits cell elongation.
10. **Expected Results:**

    Weeds: Growth stops immediately. Discolouration of dying weeds may not be noticeable for 1 - 3 weeks after application depending on growing conditions and weed species. **Poor results may be expected if** there is improper mixing, timing, coverage or when weeds are under drought stress.
11. **Effects of Rainfall:** Rainfall within 4 hours of application may lessen degree of weed control.
12. **Movement in Soil:** Refine Extra moves little in the soil and disappears from the soil quickly.
13. **Cropping Restrictions:** Barley, wheat and oats may be grazed or fed to livestock 7 days after application of Refine Extra. Do not plant to any crop until 2 months after application. Do not exceed a total of 8 g/ac per crop year. Do not apply Refine Extra plus Accord tank mix or Refine Extra plus Accord plus Avenge 200-C tank mix more than once every 2 years.

    Grazing restrictions: Do not graze the treated crop or cut for hay within 7 days of application of these mixes.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place.
17. **Resistance Management:** Refine Extra is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Refine Extra and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Reglone Desiccant *(diquat)*

Group 22

Manufacturer: **Syngenta Crop Protection Canada Inc.**

CAUTION POISON

1. **Formulations:** Liquid. 240 g/L diquat; 10 L jug, 110 L.
2. **Registered Mixes:** None.

   Surfactant: Agral 90, Ag-Surf.
3. **Crops:**

   - adzuki beans
   - alfalfa
   - bird's-foot trefoil
   - canola*
   - dry peas
   - field peas
   - flax
   - kidney beans
   - lentils
   - mustard
   - potatoes
   - red beans
   - red clover
   - soybeans
   - sunflowers (all)
   - white beans
   - white clover

   * Argentine canola varieties: should only be used to facilitate harvest of lodged crops. Losses can occur due to pod drop and pod shatter from handling and if unfavourable weather conditions occur.
4. **Weeds Controlled:** Non-selective for green vegetation, used for weed control and crop desiccation for harvest.
5. **Weeds Suppressed:** Not applicable.
6. **When Used: For crop desiccation:**

   Alfalfa, clover (for seed), trefoil: Prior to seed harvest. To prevent seed pods from shattering and subsequent loss of seed, the interval between spraying and harvest should not exceed 7 days.
   Note: Do not use Reglone on forage legumes that have been with a residual herbicide in the past 12 months.

   Beans, soybeans: Application should coincide with 80 - 90% natural leaf defoliation.

   Canola: When the crop is at the 60 - 70% seed turn (green to brown) stage.

   Chickpeas: Desi type: Apply when majority of plants are yellow, most pods are mature and seed colour has turned. **Kabuli type:** Apply when majority of plants are ripe and dry. Determine the youngest pod you will be able to harvest. Seeds from this pod should be detached and turning colour (green to white).

   Note: Chickpeas treated with Reglone Desiccant cannot be used for seeding purposes.

   Flaxseed: When the crop is at the 75% boll turn stage (normal swathing time).

   Lentils: When swathing would normally commence, lowermost pods are yellow-brown and rattle.

   Mustard: When the crop is at the 75% seed turn (green to brown) stage.

   Peas: When the crop has reached maturity.

   Potato vines: At least 2 weeks before harvest. Do not apply Reglone during drought periods, especially when soil is so dry that plant leaves wilt during the day. After such conditions wait at least 3 days after soil has been moistened by rain or irrigation.

   Sunflowers: When the seeds reach maturity (20 - 50% moisture in the seed and hull).
7. **How to Apply:**

   With: Aircraft or ground equipment. Booms on ground equipment must be high enough to ensure proper coverage of foliage.

Reglone Desiccant (cont'd)

Rate:

Reglone: Add Agral 90 at 1 L/1,000 L spray mixture.

Crop	Ground application Reglone L/ac	 Water volume L/ac	Aerial application Reglone L/ac	 Water volume L/ac
Alfalfa, bird's-foot trefoil, clover (for seed)	0.68 - 1.1	90 - 220	0.68 - 1.1	18
Beans, soybeans (normal crop)	0.68	90 - 220	0.68	18
Beans, soybeans (dense crop)	0.68	90 - 220	1	18
Canola, chickpeas*, flaxseed, lentils, mustard, peas, sunflowers (normal crop, no weeds)	0.68	90 - 220	0.68	18
Canola, flaxseed, lentils, mustard, peas, sunflowers (dense crop, weedy)	0.68		0.68	18
Potatoes (top growth fully mature, top growth light and weedy)	0.68	220 - 445	0.68	18
Potatoes (light stands, little weed growth)	0.68 - 1.0	220 - 445	0.68 - 1.0	18
Potatoes (heavy stands or weedy fields)	1.4	220 - 445	1.4	18

* Not registered for aerial application.

Note: Add Agral 90 or Ag-Surf at the rate of 1 L/1,000 L of spray solution

Water volume: Aircraft: 18 L/ac. Ground: 100 - 400 L/ac. Higher volumes for best results.

Alfalfa, canola, clover, trefoil, beans, soybeans, flax, mustard, peas, sunflowers: 90 - 180 L/ac.

Pressure: 275 - 400 kPa.

Nozzles: Aircraft flat fan type or hollow cone type (D8, D10 or D12 disc with 46 or 56 swirl plate). For ground application, flat fan.

8. **Application Tips:** Muddy water will reduce effectiveness. Applications made on cloudy days or just prior to or during periods of darkness will increase effectiveness. Polish varieties may be straight combined. Immature weeds may require higher application rates to increase effectiveness.

9. **How it Works:** Reglone is a contact type herbicide; therefore, thorough spray coverage is essential. Absorbed by all leaf and stem surfaces, non-systemic. Interferes with photosynthesis.

   Warning: During adverse weather (heavy rain, hail or strong winds), the resultant damage to crops may be enhanced.

10. **Expected Results:**

    Weeds: Fast and virtually complete top kill of annual weeds. Yellowing starts within a few hours of application. Desiccation of the plant will continue rapidly till death.

    Crops: Leaf kill will occur within a few days of application. Stem dry-down will take longer depending on the crop; however, harvesting should normally commence within 7 - 14 days. Crop losses can occur due to pod drop and pod shatter from handling and if unfavourable weather conditions occur.

11. **Effects of Rainfall:** No effect once the spray solution has dried.

12. **Movement in Soil:** Binds to the soil and becomes biologically unavailable. No residual effect.

13. **Cropping Restrictions:**

    Grazing restrictions: Crop waste remaining after harvest (e.g. pea and lentil vines, alfalfa stems, etc.) may be used as a feed supplement for livestock. Prevent drift onto crops, ornamental plants, lawns, shelterbelts, grazing areas, wildlife cover, wetlands and other desirable growth.

14. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = 230 mg/kg. **Potential to cause eye damage, if eyes are constantly exposed.** May cause oral and nasal irritation shortly after use. Does not cause lung damage. May cause burns upon contact with skin and eyes. Intake can cause kidney failure and liver damage.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Heated storage is necessary. Store in original container, tightly closed in a safe place away from children.

17. **Resistance Management:** Reglone Desiccant is a Group 22 herbicide. Any weed population may contain or develop plants naturally resistant to Reglone Desiccant and other Group 22 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Remedy/Garlon 4 *(triclopyr)*

Group 4

Manufacturer: **Dow AgroSciences Canada Inc.**

CAUTION POISON

1. **Formulations: Remedy:** Emulsifiable concentrate; 480 g/L; 10 L jug.
   Garlon4: Emulsifiable concentrate; 480 g/L; 10 L jug; 110 L container.
   Note: Garlon 4 is available only to authorized pesticide applicators.
2. **Registered Mixes:** None.
3. **Crops: Remedy:** Pasture, rangeland. **Garlon 4:** Communication lines, fence rows, industrial manufacturing, pipelines, power lines, rail roads, roadsides, storage sites, utility rights-of-way.
4. **Weeds Controlled:**

Brush

alder
aspen
balsam poplar*
birch
chokecherry*
cottonwood
dogwood
elderberry
maples*
pine*
poison oak
raspberry*
tamarack
wild rose
willow

* Hard to control.

Weeds

burdock
curled dock
dandelion
field bindweed
lamb's-quarters
ragweed
smartweed
smooth bedstraw
vetch
wild lettuce

5. **Weeds Suppressed:** None.
6. **When Used:**

Foliar applications: For best results, application of Remedy or Garlon 4 should be made when brush is actively growing. Applications can commence once leaves are fully expanded and continue until 10 days prior to the first signs of autumn colouration. Unsatisfactory results are likely if foliage has lost its normal colour and/or texture.

Basal bark applications: Any time (dormant or growing) the target zone of the stem and/or root collar can be clearly seen and treated. Stems must be dry when application is made.

Remedy/Garlon 4 (cont'd)

7. **How to Apply:**

A. Ground application

With: Boom, Radi-arc, OC nozzles, handgun or backpack.

Rate:

Brush: 1.6 - 3.2 L/ac.

Weeds: 0.4 - 1.6 L/ac.

Water volume: 80 L/ac or more.

Nozzles: Apply with a medium or coarse droplet nozzle that will ensure good uniform coverage of leaves.

B. Aerial application

With: Fixed wing or rotary wing aircraft.

Rate:

Brush: 1.6 - 3.26/ac.

Water volume: 18 L/ac minimum. 60 L/ac with a thru-valve boom.

Nozzles: Apply with a medium or coarse droplet nozzle that will ensure good uniform coverage of leaves.

8. **Application Tips:**

Foliar application: Weeds and brush should be actively growing. Best results occur when uniform coverage occurs. Higher application volumes (80 L/ac or more), depending on the application system, provide the desired uniformity of coverage. The key to successful applicaiton is even uniform application with no shadows or scattered, large splotch drops on target plants. Do not treat woody plants more than 2.5 m in height. For woody plants exceeding 2.5 metres, cut and spray regrowth or use basal bark treatment. Use higher rates for species listed as hard to control. Use higher rate for late summer application when plant growth rates are reduced. If lower rates are used on hard to control species, resprouting may occur and treatment may be necessary the following year. Do not contaminate water. Keep out of lakes, streams, ponds, irrigation ditches and domestic water supplies. Avoid drift or overspray of vegetable crops, grapes, fruits, flowers and other desirable broadleaf plants.

Streamline basal bark treatment: Use 20 or 30 L of Remedy or Garlon 4 in enough mineral oil dilutent to make 100 L of spray mixture. Use on stems that are 8 cm in basal diameter. Apply sufficient spray to form a band 5 cm wide. If stems are 8 - 15 cm in diameter, treat both sides of the stem so that a 5 cm wide band is treated. Direct spray to a point on the stem 30 - 50 cm above ground level. Old rough bark may require more spray than smooth young bark. Apply any time, including winter months, except when snow or water prevent spraying at desired height above ground level. To control resprouting of cut stumps of woody species, mix 20 - 30 L of Remedy or Garlon 4 in enough mineral oil to make 100 L of spray mixture. Apply with a backpack sprayer using a flat fan or a solid cone nozzle. Thoroughly wet outer portion of the cut surface adjacent to the cambium and the sides of the stumps, including the root collar area, but not to the point of runoff. Apply at any time including winter months, except when snow or water prevents spraying to the ground line. Care must be given to ensure treatment of all cut stems in a clump.

9. **How it Works:** Interferes with cell division and elongation, causing leaf cupping, stem distortion and eventual death. Remedy/Garlon 4 is absorbed through leaves and stems of susceptible plants.
10. **Expected Results:** Within 1 or 2 weeks of treatment, leaves of treated vegetation display cupping and browning. Within the first season, smaller twigs and stems become brittle and die.
11. **Effects of Rainfall:** Rain within 2 hours of application may cause poor results to occur.
12. **Movement in Soil:** Triclopyr is relatively strongly bound to organic carbon and clay colloids, so movement with soil water is unlikely to occur.

13. **Cropping Restrictions:**

Grazing restrictions:

Grazing or harvesting green forage:

1. Lactating dairy animals:
   Up to 1.9 L/ac – Do not feed for 14 days following treatment.
   1.9 - 3.2 L/ac – Do not feed for 60 days following treatment.
2. Other livestock:
   Up to 1.9 L/ac – No restriction.
   1.9 - 3.2 L/ac – Do not feed for 14 days following treatment.

Note: If less than 25% of grazed area is treated, there is no grazing restriction (**for other livestock only**).

Haying (harvesting of dried forage):

1. Lactating dairy animals:
   Do not feed hay which has been harvested within 60 days of treatment.
2. Other livestock:
   Up to 1.9 L/ac – Do not harvest hay for 7 days following treatment.
   1.9 - 3.2 L/ac – Do not harvest hay for 14 days following treatment.

14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (male rats) = technical triclopyr 729 mg/kg; Formulated product = 2,460 mg/kg.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in a cool, dry place above -2°C. If stored below -2°C, agitate before use.

17. **Resistance Management:** Remedy/Garlon 4 is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Remedy/Garlon 4 and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Reward *(diquat)*

Group 22

Manufacturer: **Syngenta Crop Protection Canada Inc.**

CAUTION POISON

1. **Formulations:** 240 g/L; 4 x 3.78 L case.
2. **Registered Mixes:** None.
3. **Crops:** For control of weeds in still or slow moving water of farm ditches, farm dugouts, farm ponds, lakes and canals.
4. **Weeds Controlled:** Canada waterweed, coontail, duckweed, pondweeds, water milfoil.
5. **Weeds Suppressed:** Algae: Cladophora, Pithophora and Spirogyra will be temporarily controlled.

Reward (cont'd)

6. **When Used:** Apply only after weeds are visible and in an active growth stage, which is normally sometime in late May through June as growth depends on water temperatures. Application must be made to actively growing weeds before they become so thick that they make application difficult. Application to dense growth of mature or fully established weeds will not give satisfactory control.
7. **How to Apply:**

   For floating weeds, use surface application: Dilute one part Reward with at least four parts clean water and spray over water surface. Apply from the banks of small bodies of water.

   For submerged weeds, inject below the water surface: A suction type of boat bailer is mounted on the cavitation plate of an outboard motor and the end of the inlet tube inserted into a solution containing one part Reward diluted with at least 10 parts of clean water (a backpack sprayer may also be used). Make lines of travel at regular intervals through the water (3 m or less apart) over the area to be treated until the whole area has received a uniform application.

   Rate:

   For areas less than 1.5 m (5 feet) deep: 7.4 L/ac.

   For areas more than 1.5 m (5 feet) deep: 10 - 11.8 L/ac.

   Calculating area to be treated: length (m) x width (m) ÷ 10,000 m^2 x 2.47 = acres.
8. **Application Tips:** Do not apply to muddy water and do not agitate water excessively during one or two days after treatment as the effectiveness of the chemical will be reduced. Use clean water for diluting the chemical. Do not use wetting agents or surfactants for water treatment. Repeat treatment may be necessary if weed growth reappears. Avoid application or drift onto crops or other desirable growth.
9. **How it Works:** Reward is a contact herbicide. Thorough coverage on the weeds is essential to ensure satisfactory control. Interferes with photosynthesis.
10. **Expected Results:** Control of susceptible weeds generally occurs within 1 - 2 weeks.
11. **Effects of Rainfall:** None.
12. **Movement in Soil:** Is absorbed rapidly and becomes biologically inactive and unavailable upon contact with soil, mud or lake bottoms.
13. **Cropping Restrictions:** Do not use treated water for at least 24 hours after application for swimming or animal consumption. For human consumption and irrigation do not use for at least 5 days after treatment. In water containing fish, do not treat more than 1/4 to 1/3 of the area at one time, otherwise the dying weeds over a large area will cause a serious loss of oxygen which may result in injury or kill the fish.
14. **Toxicity:** Acute mammalian toxicity. Oral LD_{50} (rats) = 1,389 mg/kg. Potential to cause eye damage, if eyes are constantly exposed. May cause oral and nasal irritation shortly after use. May cause burns upon contact with skin and eyes. Intake can cause kidney failure and liver damage.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store above 0°C. If frozen, warm to room temperature, agitate gently until reconstituted.
17. **Resistance Management:** Reward is a Group 22 herbicide. Any weed population may contain or develop plants naturally resistant to Reward and other Group 22 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Roundup Weather Max/ Roundup Transorb/Roundup Original/Roundup Dry *(glyphosate)*

Group 9

Manufacturer: **Monsanto Canada Inc.**

CAUTION IRRITANT

1. Formulations:

Weather Max: 540 g/L glyphosate acid equivalent (present as potassium salt), 10 L, 115 L, 450 L, 1,000 L.

Transorb: 360 g/L glyphosate acid equivalent (present as isopropylamine salt), 10 L, 115 L, 450 L, 750 L, 1,200 L.

Original: 356 g/L glyphosate acid equivalent (present as isopropylamine salt), 10 L, 115 L, 450 L, 750 L.

Dry: Water soluble granules; 68.5 glyphosate acid equivalent (present as monoammonium salt), 10.95 kg/box.

2. Registered Mixes:

Chemical fallow: 2,4-D (Amine or Ester) or Banvel II or Pardner + non-ionic surfactant.

Minimum tillage: Pardner + non-ionic surfactant, 2,4-D (Amine and Ester) or Banvel II or Pardner + non-ionic surfactant.

Roundup Ready canola: Lontrel.

Surfactants: Ag-Surf, Agral 90, Companion, Enhance, Frigate.

3. Crops: Prior to planting (all crops), fall stubble treatment, spot treatment (in-crop), non-crop areas, minimum or zero till cropping systems, pasture renovation, summerfallow, preharvest in flax (including linola), wheat, barley, oats, canola, lentils, peas, soybeans, dry beans, forages.

4. Weeds Controlled:

Annuals

annual bluegrass (9.0)
annual sow-thistle
Canada fleabane
cleavers*
common ragweed
cow cockle*
dodder
downy brome
flixweed
giant foxtail
green foxtail
hemp-nettle
kochia
lady's-thumb
lamb's-quarters
large crabgrass
narrow-leaved hawk's-beard
narrow-leaved vetch
Persian darnel
prickly lettuce
redroot pigweed
Russian thistle
shepherd's-purse
stinkweed
volunteer barley
volunteer canola
volunteer corn
volunteer flax
volunteer mustard
volunteer wheat
wild buckwheat (6.7)
wild mustard
wild oats

Perennials

alfalfa
Canada bluegrass
Canada thistle (7.8)
cattail
common milkweed
cottontop
curled dock
dandelion
field bindweed
foxtail barley
hemp dogbane
hoary cress
Japanese knotweed
Kentucky bluegrass
perennial sow-thistle
poison ivy
purple loosestrife
quackgrass
smooth bromegrass
toadflax
wormwood
yellow nutsedge

Brush

alder
birch
maple
pine
poplar
raspberry
sheep laurel
snowberry
willow

* Transorb/Original only

5. Weeds Suppressed: Some weeds suppressed at lower rates.

6. **When Used:**

Annual weeds: Grassy and broadleaf weeds at least 15 cm tall and actively growing. Dodder: spot treatment in sugar beets.

Perennial weeds:

Canada thistle (bud stage): At or beyond bud stage of growth.

Canada thistle (fall rosette): 15 cm in diameter and at least 5 weeks of growth. Majority of them in a rosette stage.

Dandelion: Prior to seeding and post harvest.

Field bindweed: At or beyond full bloom and actively growing.

Milkweed: Bud to full bloom stage of growth.

Note: Reduced results may occur on plants treated after full bloom.

Quackgrass (spring, summerfallow, preharvest, fall stubble): At least 20 cm in height (3 - 4 leaf stage) of growth and actively growing.

Quackgrass (fall tilled ground): Delay application in the spring until majority of quackgrass has 4 - 5 leaves. This stage usually occurs 1 - 4 weeks later on fall tilled ground than on undisturbed ground.

Other perennials: Mostly in head and early bud stage.

Brush: Actively growing brush from June through August.

7. **How to Apply: Do not use galvanized steel or unlined steel tanks as a combustible gas may be formed.**

With: Ground equipment only: boom equipment, handgun, high volume equipment, wipers.

Rate:

Annual Weed Control

Rate (per ac)	Growth stage	Weeds controlled	Comments (apply in 20 - 40 L/ac water)
Weather Max 0.2 L Transorb/Original 0.3 L Dry 0.16 kg	Weeds up to 8 cm in height	Green foxtail, lady's-thumb, stinkweed, volunteer barley, non glyphosate tolerant volunteer canola, volunteer wheat, wild mustard, wild oats.	For wild oats, apply at 1 - 3 leaf stage. Add 0.14 L of a surfactant registered for use such as Agral 90, Ag-Surf and Companion. For heavy wild oat infestations, use 0.27 L/ac of Weather Max.
Weather Max 0.27 L Transorb/Original 0.4 L Dry 0.21 kg	Weeds 8 cm to 15 cm in height	For annual grasses listed above plus foxtail barley** (suppression only). All other broadleaf weeds listed above plus flixweed** and kochia**.	Add 0.4 L of surfactant registered for use as listed above. Apply before initiation or senescence. ** Suppression only.
Weather Max 0.33 - 0.51L Transorb/Original 0.51 - 0.77L Dry 0.27 - 0.40kg	Weeds up to 15 cm in height	All annual grasses listed above plus downy brome, giant foxtail, Persian darnel. All annual broadleaf weeds listed above plus Canada fleabane, cleavers, common ragweed*, flixweed, hemp-nettle, lamb's-quarters, narrow-leaved hawk's-beard***, redroot pigweed, Russian thistle, volunteer flax, wild buckwheat**.	No additional surfactant is required. * **Do not use** these rates on plants greater than 8 cm in height. ** For 3 - 4 leaf stage, use 0.51 L/ac of Weather Max. *** For weeds 8 - 15 cm in height, use 0.77 L/ac rate.

(continued)

Roundup Weather Max/Roundup Transorb/Roundup Original/Roundup Dry (cont'd)

Annual Weed Control *(continued)*

Rate (per ac)	Growth stage	Weeds controlled	Comments (apply in 20 - 40 L/ac water)
Weather Max 0.61 L Transorb/Original 0.91 L Dry 0.48 kg	Weeds up to 15 cm in height	All annual grasses listed above, plus annual blue grass, crab grass. All broadleaf weeds listed above plus annual sow-thistle, kochia, narrow-leaved vetch, prickly lettuce, shepherd's-purse.	For additional broadleaf weed control option, refer to tank mix table.
Weather Max 0.94 L Transorb/Original 1.42 L Dry 0.74 kg	Weeds over 15 cm in height	All annual grasses and broadleaf weeds listed above.	For additional broadleaf weed control option, refer to tank mix table.

Perennial Weed Control

Weed/ Growth stage	Application rate Weather Max (L/ac)	Transorb/ Original (L/ac)	Dry (kg/ac)	Water volume (L/ac)	Comments
Alfalfa					
Early bud to full bloom stage. Fall application only.	1 - 1.34	1.5 - 2.0	0.80 - 1.1	20 - 120	Allow 5 or more days after treatment before tillage. Use the higher rates when alfalfa populations are high or when heavy grass infestations are also present. For spring applications and control in minimum tillage systems using a 2,4-D tank mix, see section 8.
Canada thistle					
Rosette stage (summer fallow)	0.67	1	0.53	20 - 40	Allow 10 or more days after treatment before tillage.
Bud stage or beyond	1.28 - 1.89	1.9 - 2.8	1.0 - 1.5	20 - 120	Allow 5 or more days after treatmenat before tillage.
Dandelion					
<15cm	0.67	1.0	0.53	20 - 40	Allow 3 or more days after treatment before tillage for all rates. Use the higher rates when infestations are heavy.
>15 cm	1 - 1.34	1.5 - 2.0	0.80 - 1.1	20 - 40	
Rosette to full bloom (preharvest)	0.67	1.0	0.53	20 - 40	Allow 7 or more days after pre-harvest treatment before tillage.
Field bindweed					
Full bloom or beyond	1.89 - 3.24	2.8 - 4.8	1.0 - 1.5	20 - 120	Allow 7 or more days after treatment before tillage.

(continued)

Roundup Weather Max/Roundup Transorb/Roundup Original/Roundup Dry (cont'd)

Perennial Weed Control *(continued)*

	Application rate				
Weed/ Growth stage	**Weather Max (L/ac)**	**Transorb/ Original (L/ac)**	**Dry (kg/ac)**	**Water volume (L/ac)**	**Comments**
Foxtail barley					
Seedling to heading	0.67 - 1.34	1 - 2	0.53 - 1.1	20 - 40	Allow a minimum of 1 day after treatment before tillage or seeding. Use higher rate for larger, more established plants, heavy infestations or if plants are stressed.
Quackgrass					
(control, light to moderate infestations)					
3 - 4 green leaves or more	0.67	1	0.53	20 - 120	Allow 3 or more days after treatment before tillage. For higher water volumes (i.e. 60 - 120 L/ac), an approved surfactant must be added at 0.5 litres per 100 litres of clean water (0.5% v/v).
(long-term control, heavy infestations, high water volumes)					
3 - 4 green leaves or more	0.67 - 1.89	1 - 2.8	0.53 - 1.5	20 - 120	Allow 3 or more days after treatment before tillage. Rates higher than 0.67 L/ac of Weather Max provide more consistent long-term control, especially with heavier infestations and/or higher water volumes (i.e. 60 - 120 L/ac).
Toadflax					
Vegetative stage (summer fallow)	0.67	1	0.53	20 - 40	Allow 7 or more days after treatment before tillage.

Roundup Weather Max/Roundup Transorb/Roundup Original/Roundup Dry (cont'd)

Annual Weed Control with Roundup Tank Mixtures (summer fallow and minimum tillage systems)

Tank mixtures	Rate (per ac)	Weeds controlled	Comments (apply in 20 - 40 L/ac water and add 0.14 L/ac of surfactant)
Product + Banvel II			
Weather Max	0.20 - 0.27 L + 0.12 L	Cow cockle, flixweed, green foxtail, kochia, lady's-thumb, lamb's-quarters, redroot pigweed, Russian thistle, stinkweed, non glyphosate tolerant volunteer canola (rapeseed), volunteer cereals, wild buckwheat**, wild mustard*, wild oats.	This tank mixture is registered for **summer fallow use only**. Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height.
Transorb/Original	0.3 - 0.4 L + 0.12 L		
Dry	0.16 - 0.21 kg + 0.12 L		
Product + 2,4-D LV Ester 600*****			
Weather Max	0.20 - 0.27 L + 0.48 L	Flixweed, green foxtail*, kochia, lady's-thumb, lamb's-quarters**, redroot pigweed, Russian thistle, stinkweed, volunteer canola (rapeseed), volunteer cereals, wild mustard, wild oats.	This tank mixture is registered for **summer fallow use only.** Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height.
Transorb/Original	0.3 - 0.4 L + 0.48 L		
Dry	0.16 - 0.21 kg + 0.48 L		
Product + 2,4-D LV Ester 600*****			
Weather Max	0.33 - 0.50 L + 0.24 - 0.36 L	Bluebur, burdock, Canada fleabane, common plantain, daisy fleabane, downy brome, flixweed, giant foxtail, goat's-beard, green foxtail, hemp-nettle, kochia, lady's-thumb, lamb's-quarters, mustards (except dog & tansy), narrow-leaved hawk's-beard****, Persian darnel, prickly lettuce, ragweeds, redroot pigweed, Russian pigweed, Russian thistle, shepherd's-purse, stinkweed, sweet clover, thyme-leaved spurge, volunteer cereals, volunteer flax, **volunteer Roundup Ready (1 - 4 leaf stage)**, wild buckwheat***, wild mustard, wild oats, wild radish, wild sunfower.	Use this tank mixture prior to seeding or after seeding but before crop emergence in barley, rye, spring and winter wheat. **No surfactant is required.**
Transorb/Original	0.5 - 0.75 L + 0.24 - 0.36 L		
Dry	0.27 - 0.4 kg + 0.24 - 0.36 L		

(continued)

Roundup Weather Max/Roundup Transorb/Roundup Original/Roundup Dry (cont'd)

Annual Weed Control with Roundup Tank Mixtures (summer fallow and minimum tillage systems) *(continued)*

Tank mixtures	**Rate (per ac)**	**Weeds controlled**	**Comments (apply in 20 - 40 L/ac water and add 0.14 L/ac of surfactant)**
Product + 2,4-D LV Ester 600*****			
Weather Max	0.33 - 0.50 L + 0.49 - 0.61 L	Above weeds plus annual sow-thistle, common chickweed, common purslane, dog mustard, groundsel, hawkweed, heal all, knotweed, oak-leaved goosefoot, peppergrass, pineapple weed, prostrate pigweed, sheepsorrel, smartweed, tansy mustard, tumble pigweed, volunteer canola, **volunteer Roundup Ready canola (4 - 6 leaf stage).**	
Transorb/Original	0.5 - 0.75 L + 04.9 - 0.61 L		
Dry	0.27 - 0.4 kg + 0.49 - 0.61 L		
Product + Pardner			
Weather Max	0.20 - 0.27 L + 0.5 L	Green foxtail, kochia**, lady's-thumb, redroot pigweed**, stinkweed, volunteer canola (rapeseed), volunteer cereals, wild buckwheat*, wild mustard, wild oats**.	This tank mixture is registered for **summer fallow use only** and prior to barley, oats and wheat in minimum tillage systems. Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height.
Transorb/Original	0.3 - 0.4 L + 0.5 L		
Dry	0.16 - 0.17 kg + 0.5 L		

* Use the highest rate within the rate range for control.

** Suppression only. See other tank mixtures for control options.

*** For 3 - 4 leaf stage, use the highest rate within the rate range for control.

**** For weeds 8 - 15 cm in height, use the highest rate within the rate range for control.

***** Adjust rates accordingly for other 2,4-D formulations.

Roundup Weather Max/Roundup Transorb/Roundup Original/Roundup Dry (cont'd)

Annual Weed Control with Roundup Tank Mixtures (summer fallow and minimum tillage systems)

Rate (L/ac)	**Weeds controlled**	**Comments (apply in 50 - 100 L/ac water)**
0.5 - 0.77 Roundup Transorb + 0.2 - 0.28[1] MCPA	Canada fleabane, common ragweed*, downy brome, flixweed, gaint foxtail, green foxtail, hemp-nettle, kochia, lady's-thumb, lamb's-quarters, narrow-leaved hawk's-beard***, Persian darnel, redroot pigweed, Russian thistle, stinkweed, volunteer canola (rapeseed) (non-Roundup Ready), volunteer flax, volunteer cereals, wild buckwheat**, wild mustard, wild mustard.	**Use this tank mix prior to seeding in wheat, barley, rye, oats, corn (field & sweet), flax, and field peas.** No surfactant required. * **Do not** use these rates on plants greater than 8 cm in height. ** For 3 - 4 leaf stage, use 0.77 L/ac rate. *** For weeds 8 cm to 15 cm in height, use 1.9 L/ac rate. [1] MCPA amine at 0.2 - 0.28 L/ac (101 - 141 g ai/ac) **prior to peas**.
0.5 - 0.77 Roundup Transorb + 0.2 - 0.4[2] MCPA* 500 g/L formulation, if another formulation is used, adjust rate accordingly.	Bluebur[3], burdock (before 4 leaf stage), false flax[3], flixweed, lamb's-quarters[3], mustard[3] (except dog & tansy), prickly lettuce[3], ragweed[3], redroot pigweed[3], Russian pigweed[3], shepherd's-purse[3], stinkweed[3], vetch[3], wild radish[3], wild sunflower[3].	[2] MCPA at 0.2 - 0.4 L/ac (101 - 202 g ai/ac) **prior to wheat, barley, oats, corn (field & sweet), rye and flax**. [3] MCPA at 0.28 - 0.4 L/ac (141 - 202 g ai/ac) only.
0.5 - 0.77 Roundup Transorb + 0.2 - 0.4[1] Buctril M	Canada fleabane, common ragweed*, downy brome, flixweed, giant foxtail, green foxtail, hemp-nettle, kochia, lady's-thumb, lamb's-quarters, narrow-leaved hawk's-beard***, Persian darnel, redroot pigweed, Russian thistle, stinkweed, **volunteer canola (rapeseed) (non-Roundup Ready)**, volunteer cereals, volunteer flax, **volunteer Roundup Ready Canola (1 - 4 leaf stage)**[1,2], wild buckwheat**, wild mustard, wild oats. **Seedlings up to the 4 leaf stage**[2]: American nightshade, ball mustard, bluebur, cow cockle, flixweed, green smartweed, kochia[3], lady's-thumb, night-flowering catchfly, pale smartweed, redroot pigweed, Russian thistle[3], scentless chamomile[4], shepherd's-purse. **Seedlings up to 6 leaf stage:** Wild tomato. **Seedlings up to 8 leaf stage:** Common buckwheat, common groundsel, common ragweed, lamb's-quarters, stinkweed, tartary buckwheat, wild buckwheat, wild mustard, wormseed mustard. **Perennials (top growth)**[2]: Canada thistle, perennial sow-thistle.	**Use this tank mix prior to seeding in wheat, barley, rye, oats, corn, flax, canary seed and seedling grasses (for complete listing of grasses, refer to label).** No surfactant required. * **Do not** use these rates on plants greater than 8 cm in height. ** For 3 - 4 leaf stage use 0.77 L/ac rate. *** For weeds 8 cm to 15 cm in height use 0.77 L/ac rate. [1] Buctril M at 0.2 - 0.4 L/ac (113 - 226 g ai/ac) for all crops listed. [2] Buctril M at 0.4 L/ac (226 g ai/ac only). [3] Spray before plants are 5 cm high. [4] Spring annuals only. 5 Spray before plants are 8 cm high.

* Use only amine formulations of MCPA prior to corn and peas.

Roundup Weather Max/Roundup Transorb/Roundup Original/Roundup Dry (cont'd)

Preplant or preseed application in direct seeding systems (all crops): 0.33 - 0.54 L/ac of Weather Max for annual weeds up to 15 cm in height. Apply prior to seeding or after seeding, but before crop emergence for control of emerged weeds in direct seeding systems. Ensure weeds are at the desired stage at time of application. This product does not provide pre-emergent weed control, and newly germinating weeds may be a problem in the crop.

Water volume: Handgun, high volume (coarse sprays only): 80 - 120 L/ac. Boom: 20 - 120 L/ac. Chemical fallow, reduced rates: 20 - 40 L/ac. Always use clean water, free of sediments.

Pressure: 275 kPa.

Nozzles: Flat fan nozzles for volumes 20 - 40 L/ac: flood jet type or flat fan for volumes above 40 L/ac.

8. **Application Tips:** Tillage or mowing prior to application will reduce effectiveness on perennial weeds. Minimum (days) to wait before tillage after Roundup applications: annual weeds (1); spring and fall quackgrass (3); Canada thistle bud stage (5), fall rosette stage (7 - 10); field bindweed, milkweed, other perennials (7). Before commencing tillage, allow at least 3 full days (72 hours) after application for quackgrass control and 5 - 7 days after application for thistles if applied other than at early bud stage.

Quackgrass control:

Spring and fall treatments in annual and forage cropping systems: Apply to actively growing quackgrass. Reduced control may result if rhizomes become dormant. This may occur when soil fertility is poor or land has not been tilled for several years.

Application on forages should be followed by tillage and should be made when good growing conditions exist.

Fall treatments should be applied 3 - 4 weeks after swathing to actively growing quackgrass.Quackgrass can be treated after mild frost provided there are 3 - 4 green leaves actively growing at the time of application. Do not apply after first damaging frost in the fall. Frost of -5°C is usually tolerated by new shoots. Frost damage is evident by the drying of new shoots shortly after frost.

Allow 3 or more days after application before tillage.

For best results on fall tilled ground, delay application in the spring until majority of quackgrass has 4 - 5 leaves. This stage usually occurs 1 - 4 weeks later on fall tilled ground than on undisturbed ground.

Canada thistle (fall rosette): Conduct summerfallow tillage as usual and perform last tillage operation between July 15 and August 1. Allow thistles to regrow for a minimum of 5 weeks until they are 15 cm in diameter and majority of them are in a rosette stage.

Toadflax: To ensure the proper timing, conduct summerfallow tillage as usual and perform the last tillage operation from July 15 to July 21. Allow toadflax to regrow for a minimum of four weeks following last tillage. When the toadflax reach the height of 15 cm and have a large number of green leaves, apply 1.0 L/ac. Wait a minimum of 7 days after application before tilling again.

Note: Canada thistle and toadflax can be treated after a mild frost provided the leaves are still green and actively growing at the time of application. Do not treat after first killing frost.

Alfalfa control with 2,4-D tank mix: For fall control of established stands of alfalfa, apply 0.67 - 1.34 L/ac of Weather Max + 0.48 - 0.97 L/ac of any 500 g/L of 2,4-D Amine or Ester in 40 - 80 L/ac of water. For spring applications, use only the low rate of 2,4-D and 1 - 2 L/ac of Roundup. Only cereal crops not underseeded to legumes may be planted following spring applications of this tank mix. A 14 day interval between application and planting is required. Use the higher Roundup rates when perennial grasses are prevalent.

9. **How it Works:** A non-selective, systemic herbicide that moves from the foliage into the roots and kills the entire plant.

10. **Expected Results:** Wilting and yellowing of annuals occurs within 2 - 4 days; perennials require 7 - 10 days. Complete browning of above ground growth and deterioration of roots occurs. Cool or cloudy weather may slow activity.

11. **Effects of Rainfall:** Heavy rainfall immediately after application may wash the chemical off the foliage, and a repeat treatment may be required. Do not apply if rainfall is forecast for the time of application.
12. **Movement in Soil:** The amount of glyphosate leaching is very low.
13. **Cropping Restrictions:**

    Grazing restrictions: All portions of the treated crops may be fed to livestock.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 4,320 mg/kg. Eye irritant. Non-toxic to bees, birds and fish.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Heated storage not required.
17. **Resistance Management:** Weather Max/Roundup Transorb/Roundup Original/Roundup Dry is group 9 herbicide. Any weed population may contain or develop plants naturally resistant to Weather Max/Roundup Transorb/Roundup Original/Roundup Dry and other Group 9 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Roundup Ready Canola (Weather Max, Original and Transorb only)

Crop: Canola with Roundup Ready Gene. Note: Always use pedigreed (i.e. certified) canola seed. Canola, which is not designated as glyphosate tolerant, will be damaged or destroyed by this treatment.

Weed controlled, growth stage and rate:

Product rate		
Weather Max	**Transorb/Original**	**Weeds controlled**
0.22 - 0.33 L/ac	0.33 - 0.50 L/ac	**Annual weeds:** Barnyard grass**, chickweed, cleavers, corn spurry, cow cockle, flixweed, green foxtail, hemp-nettle, kochia, lady's-thumb, lamb's-quarter, narrow-leaved hawk's-beard, night-flowering catchfly, redroot pigweed, round-leaved mallow, Russian thistle, shepherd's-purse, smartweed, stinkweed, stork's-bill, volunteer barley, volunteer canola (except Roundup Ready varieties), volunteer wheat, wild buckwheat, wild mustard, wild oats, wild tomato.
0.33 L/ac	0.5 L/ac	Cleavers, cow cockle*, flixweed**, narrow-leaved hawk's-beard**, night-flowering, catchfly*, shepherd's-purse, smartweed*, stork's-bill**, wild buckwheat. **Perennial weed suppression:** Canada thistle, dandelions, perennial sow-thistle, quackgrass (season-long control).
Repeat application at 0.33 L/ac	Repeat application at 0.5 L/ac	**Perennial weed season-long:** Foxtail barley, round-leaved mallow.
0.50 L/ac	0.75 L/ac	**Perennials (season-long control):** Canada thistle, perennial sow-thistle.

* The lower rate can be used for control of cow cockle and night-flowering catchfly at 1 - 3 leaf stage of crop or for control of smartweed at 4 - 6 leaf stage.

** Weather Max and Transorb only.

Roundup Weather Max/Roundup Transorb/Roundup Original/Roundup Dry (cont'd)

Application tips: Repeat applications may be required if second flush of weeds germinates prior to canopy closure. Ensure crop has not advanced beyond the recommended growth stage. A short term visual yellowing may occur when Roundup Original, or Roundup Transorb is applied at the late application 4 - 6 leaf stage of the crop. This effect is temporary and will not influence crop growth, maturity or yield. **Maximum 1L/ac of Transorb/Original or 0.67 L/ac of Weather Max is allowed for post-emergence use.**

With: Ground application only. **Do not apply by air.**

Water volume: 20 - 40 L/ac.

Crop stage: 0 - 6 leaf stage.

Grazing or cropping restrictions: Do not graze the treated crop or cut for hay; sufficient data are not available to support such use.

Roundup Ready Corn (Weather Max and Transorb only)

Crop: Corn with the Roundup Ready gene. **Note** – Always use glyphosate tolerant pedigreed (i.e. certified) corn seed. Corn that is not designated as glyphosate tolerant will be damaged or destroyed by this treatment.

Weed controlled, growth stage and rates:

Product rate	Weeds controlled
Weather Max 0.67 L/ac Transorb 1.0 L/ac	**Annual weeds:** Barnyard grass, green foxtail, volunteer barley, volunteer wheat, wild oats.
	Annual broadleaf: Chickweed, cleavers, corn spurry, cow cockle, flixweed, hemp-nettle, kochia, lady's-thumb, lamb's-quarter, narrow-leaved hawk's-beard, night-flowering catchfly, redroot pigweed, round-leaved mallow*, Russian thistle, shepherd's-purse, smartweed, stinkweed, stork's-bill, volunteer canola (except Roundup Ready varieties), wild buckwheat, wild mustard, wild tomato
	Perennials: Canada thistle**, dandelion, perennial sow-thistle**, quackgrass

* For control of round-leaved mallow, use two applications of 1.0 L/ac of Transorb or 0.67 L/ac of Weather Max.

** A second (sequential) application of 1.0 L/ac of Transorb or 0.67 L/ac of Weather Max will improve control in heavy weed infestations.

Application tips: A second application may be used for late emerging weed flushes after initial application. This second application must be made no later than the 8 leaf stage of the corn. Weeds will be more easily controlled, and early crop competition may be avoided with applications made when weeds are small. Control of weeds greater than 25 cm in height will be inconsistent, although some weeds may be controlled.

With: Ground application only. **Do not apply by air.**

Water volume: 40 - 90 L/ac.

Crop stage: Up to and including 8 leaf stage.

Grazing and cropping restrictions: All portions of the treated crop may be fed to livestock.

Preharvest Weather Max/Transorb/Original/Dry

Application may be made prior to harvest for the control of quackgrass, Canada thistle, toadflax, dandelion, season-long control of perennial sow-thistle and most annual weeds.

Crop: Barley (including malting barley), canola (rapeseed), dry beans, flax (including low linolenic acid varieties), forages, lentils, oats, peas, soyabean, wheat.

Rate:

Weather Max: 0.67 L/ac.

Transorb/Original: 1 L/ac.

Dry: 0.53 kg/ac.

Forage crops only: Weather Max: 0.67 - 1.34 L/ac. Transorb/Original: 1 - 2 L/ac. Dry: 0.53 - 1.1 kg/ac.

With: Ground equipment. Only Roundup Original/Transorb can be applied by air.

Crop timing: For annual crops, apply when average seed moisture content is at or below 30%. Accurate measurement of seed moisture content must be made before application. This stage typically occurs 7 - 14 days before harvest. For forage crops, apply at 3 - 7 days prior to the last cut before rotation or forage renovation. Consult the table below for visual indicators of this stage in each crop.

Guidelines for Timing of Pre-harvest Applications

Crops	Per cent grain moisture	Visual symptoms
Barley, oats, wheat	Less than 30	Hard dough stage, a thumb impression remains on the seed
Canola	Less than 30	Pods are green to yellow and most seeds are yellow to brown
Dry beans	Less than 30	Stems are green to brown; pods are mature (yellow to brown); 80 - 90% leaf drop (original leaves)
Flax (not including low linolenic acid varieties)	Less than 30	Majority (75 - 80%) of bolls are brown
Forages	Not applicable	Normal stage for forage harvesting
Lentils	Less than 30	Lowermost pods (bottom 15%) are brown and seeds rattle
Peas	Less than 30	Majority 75% - 80% of pods are brown
Soybean	Less than 30	Stems are green to brown; pod tissue is dry and brown in appearance (80 - 90% leaf drop)

Weeds controlled: Canada thistle, dandelion, perennial sow-thistle (season-long), quackgrass, toadflax and most of the annual weeds.

Weed stage: For best weed control results, apply when quackgrass is actively growing and has at least 4 - 5 green leaves. For best results, Canada thistle and perennial sow-thistle should be actively growing and at or beyond the bud stage.

Application tips: This treatment may also provide harvest management benefits by drying down crop and vegetative crop growth and late tillering that may interfere with harvest operations. Apply only during the period 7 - 14 days (or 3 - 7 days for forage applications) before harvest to ensure best weed control and to maximize harvest-aid benefits. Earlier application may reduce crop yield and/or quality and may lead to excess glyphosate residues in the crop. Extremely cool, wet and/or cloudy weather between time of application and the anticipated harvest date may slow down activity of this product, thereby delaying crop dry down and harvest date.

Caution: Do not apply to any crops if grown for seed.

Consult malt buyers before using preharvest on malt barley.All portions of the treated crops may be fed to livestock.

Rustler *(glyphosate + dicamba)*

Group 9,4

Manufacturer: **Monsanto Canada Inc.**

DANGER CORROSIVE

1. **Formulations:** Water soluble liquid; 194 g/L glyphosate + 46 g/L Dicamba isopropylamine salt. 10 L, 115 L, 400 L containers.
2. **Registered Mixes:** 2,4-D.
3. **Crops:** Chemical fallow. Preseeding to cereal crop (wheat/barley).
4. **Weeds Controlled:**

   - cow cockle
   - downy brome
   - flixweed
   - green foxtail
   - kochia
   - lady's-thumb
   - lamb's-quarters
   - Persian darnel
   - redroot pigweed
   - Russian thistle
   - smartweed
   - stinkweed
   - volunteer cereals
   - volunteer rapeseed (excluding Roundup Ready canola)
   - wild buckwheat
   - wild mustard
   - wild oats

5. **Weeds Suppressed:** Foxtail barley.
6. **When Used:**

   Annual grassy weeds: Any time between emergence and heading. Wild oats 1 - 3 leaf stage.

   Annual broadleaf weeds: Up to 15 cm tall. Wild buckwheat 1 - 4 leaf stage.

   Foxtail barley: Before initiation of seed head or browning of lower leaves.

7. **How to Apply:**

   With: Ground equipment only. Avoid galvanized steel or unlined steel (except stainless steel) spray tanks.

   Rate:

Weeds	Rustler L/ac
Annual broadleaf	1.0
Annual grassy weeds	1.0
Foxtail barley	1.3
Above weeds + redroot pigweed	1.0 L/ac + 0.4 L/ac 2,4-D

   Water volume: 20 - 40 L/ac **clean** water. Lower water volume may improve results, particularly with extremely hard water (greater than 700 ppm calcium + magnesium).

   Pressure: 275 kPa.

   Nozzles: Flat fan nozzles.

8. **Application Tips:** For best control of winter annual weeds such as flixweed, 2,4-D should be applied to emerged, actively growing weeds in the fall previous to the fallow season or in early spring in the fallow season when winter annual weeds are less than 10 cm tall. Under certain stress conditions such as drought, cool temperatures or where extremely hard water (>700 ppm Ca + Mg) has been used, weed control may be reduced with this product. However, lower water volume (20 L/ac) may improve results. Clean the entire sprayer after application of this product. Failure to clean the sprayer thoroughly may result in injury to desirable crops that are subsequently sprayed. First, add clean water to the tank and thoroughly rinse the entire spray system. Secondly, fill the tank with water and ammonia (1 L household ammonia/100 L water). Pump enough solution through the system to fill all parts completely. Then fill tank, close and leave for 24 hours before draining and rinsing with water.
9. **How it Works:** A post-emergent herbicide. Moves from foliage into roots and kills entire plant.
10. **Expected Results:** Visual effects will usually appear within 5 - 7 days. Wilting or yellowing of weeds advances to complete browning of above ground growth and deterioration of affected underground parts.

11. **Effects of Rainfall:** Heavy rainfall within 2 hours may wash the chemical off the foliage and repeat treatment may be required. Rainfall within 6 hours may reduce effectiveness.
12. **Movement in Soil:** The amount of leaching is very low.
13. **Cropping Restrictions:**

    Succeeding crops: Do not seed a crop in a field treated with Rustler for at least 3 weeks after application. Certain broadleaf crops such as lentils, peas, canola and flax can be injured by a preseeding application of Rustler and should not be planted in a field that has been treated with this product.

    Grazing restrictions: Do not graze or harvest treated areas until plants have turned brown and started to deteriorate.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = glyphosate 4,300 mg/kg; Dicamba = 2,600 mg/kg. Eye irritant. May cause allergic skin reaction. Non-toxic to bees and birds. Can be absorbed through the skin and causes burns to skin and eyes.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store above 5°C to keep product in solution. If crystals form, place in a warm room (20°C). Roll or shake solution until crystals have redissolved.
17. **Resistance Management:** Rustler is both a Group 4 and a Group 9 herbicide. Any weed population may contain or develop plants naturally resistant to Rustler and other Group 4 and 9 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Select/Centurion *(clethodim)*

Group 1

Manufacturer: Arvesta Canada, Inc./Bayer CropScience

CAUTION POISON

1. **Formulations:** Emulsifiable concentrate; 240 g/L clethodim; 3 L Select + 9 L Amigo; 3 L Centurion + 9L Amigo.
2. **Registered Mixes:** Addition of the adjuvant Amigo at 0.5% v/v is mandatory. Buctril M (400 mL/ac) in flax, including low linolenic varieties. Amigo must be used in tank mix of Select/Centurion and Buctril M. Follow recommendations on Buctril M, Lontrel (flax, canola), MCPA Ester (flax), Muster (canola) labels and Pursuit (field peas, Smart canola – 85 mL/ac or 42.5 mL/ac), Muster (8 or 12 g/ac), Liberty (Liberty Link Canola).
3. **Crops:**

black dry beans
brown mustard
canola
Desi chickpea
field peas
flax
great northern dry beans
Kabuli chickpea
lentils
linola (including
  low linolenic flax)
navy dry beans
oriental mustard
pink dry beans
pinto dry beans
potatoes
red dry beans
seedling alfalfa
soybeans
sunflowers
yellow mustard

Select/Centurion (cont'd)

4. Weeds Controlled:

barnyard grass
fall panicum
green foxtail
large crabgrass
Persian darnel
proso millet
quackgrass
smooth crabgrass
volunteer barley
volunteer canary grass
volunteer corn
volunteer oat
volunteer wheat
wild oat
witchgrass
yellow foxtail

5. Weeds Suppressed: Quackgrass.

6. When Used:

Crop stage: Apply at any growth stage of crops listed above. Chickpeas: Before crop reaches the 9th node stage (18 cm height maximum).

When tank mixing Select/Centurion plus Amigo with Buctril M for use in flax, do not spray in hot humid weather when daytime temperatures are over 25 - 29°C.

Weed stage: Apply when the annual grasses and the volunteer cereals are in the 2 - 6 leaf stage. Apply Select/Centurion when quackgrass is in the 2 - 5 leaf stage. Most effective when application is made at the 3 - 5 leaf stage, and the canopy is uniform and actively growing.

7. How to Apply:

With: Ground equipment.

Rate:

Grass species	Leaf stage	Rate (mL/ac)	Rate of Amigo
Green foxtail, volunteer cereals, wild oats, yellow foxtail.	2 - 4	50	0.5% v/v
Barnyard grass, fall panicum, proso millet, volunteer canary grass, volunteer corn, witch grass.	2 - 6	50	0.5% v/v
Barnyard grass, crabgrass, fall panicum, green foxtail, Persian darnel, proso millet, quackgrass suppression, volunteer canary grass, volunteer cereals, wild oats, witch grass, yellow foxtail.	2 - 6	76	0.5% v/v
Quackgrass control	2 - 6	152	1.0% v/v

Water volume: 20 L/ac minimum - 80 L/ac maximum.

Pressure: 240 - 275 kPa minimum.

Nozzles: Flat fan recommended.

Mixing instructions:

Select/Centurion and Liberty –

1. Thoroughly clean the sprayer by flushing the system with water containing detergent.
2. Fill clean spray tank half full with clean water. Start agitation system.
3. Add the required amount of Amigo adjuvant to the tank. Continue to agitate until thoroughly mixed.
4. **Stop** agitation. Add the correct amount of Liberty to the spray tank. Start agitation system.
5. Add the correct amount of Select/Centurion along with the remaining amount of water necessary to fill the spray tank.
6. Continue to agitate or run the by-pass system and spray out immediately.

7. After any break in the spraying operation, agitate thoroughly before spraying again. Check inside the tank to ensure that sprayer agitation is sufficient to remix the spray materials. Do not allow the mixture to sit overnight.
8. If an oil film starts to build-up in the tank, drain it and clean tank with strong detergent solution.
9. Immediately after use, thoroughly clean the sprayer by flushing the system with clean water containing detergent.

For all other tank mixes, refer to instructions on Select/Centurion label.

8. **Application Tips:** The use of 80° stainless steel flat fan nozzles tilted 45° forward is recommended for optimum spray coverage. Use high water volumes on dense crop canopies for better penetration to weeds. Best results will occur if applications are made to weeds not stressed by lack of moisture, excessive moisture, low temperature and/or very low relative humidity. Select/Centurion at 50 mL/ac should only be applied under the following conditions: good crop stand, early application (prior to tillering), light to moderate weed infestation, adequate moisture and fertility, absence of stress, good growing conditions. Do not tank mix at lower rate with other pesticides. Do not apply the lower 50 mL/ac rate to volunteer winter cereals or when tank mixing with other pesticides.

9. **How it Works:** Select/Centurion is a systemic herbicide that is translocated from the treated foliage to the growing points of leaves, shoots and roots.

10. **Expected Results:**

    Weeds: Leaf foliage will first change from green to yellowish, then purplish and finally a brown colour.

    The time required for complete control is 7 - 21 days following treatment, depending on growing conditions and crop competition.

11. **Effects of Rainfall:** Rainfall within one hour of application may reduce the effectiveness of the spray.

12. **Movement in Soil:** At recommended rates, very little movement occurs.

13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze or feed treated foliage to livestock until 60 days after application. Field peas: 75 days after application. Seedling alfalfa: 30 days after application.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 3,610 mg/kg. Slightly toxic to rainbow trout.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Does not require heated storage.

17. **Resistance Management:** Select/Centurion is a Group 1 herbicide. Any weed population may contain or develop plants naturally resistant to Select/Centurion and other Group 1 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Sencor *(metribuzin)*

Group 5

Manufacturer: **Bayer CropScience**

1. **Formulations:** Flowable; Sencor 480 F; 480 g/L; 4 x 5 L pack, 2 x 10 L pack. Water dispersible granular; Sencor 75 DF; 750 g/kg; 4 x 5 kg, 4 x 2.5 kg pack. Water dispersible granular in water soluble packets; Sencor 75 (Solupak) 5 x 0.5 kg bags; 4 x 2.5 kg per case.
2. **Registered Mixes:** Banvel (barley, wheat); Target (barley, wheat); MCPA Amine 500 (barley, wheat); Eptam (potatoes); 2,4-D Amine (barley and wheat); Treflan 545 EC (fababeans, field peas); MCPA Na-salt (field peas), Eptam (potatoes).

   Mixing instructions: Shake container thoroughly before adding to spray tank. Mix Sencor in the tank before adding Edge or Treflan. Continually agitate until all the mixture is sprayed. Do not allow the sprayer to stand without agitation. When tank mixing with other products, add Sencor first then the tank mix partner.

   Mixing restrictions: Do not tank mix with any other pesticide, wetting agent or surfactant.
3. **Crops:**

alfalfa (established)
asparagus
barley (8.9)
fababeans (8.6)*
field peas (8.5)
lentils (8.4)***
potatoes (8.6)**
processing peas (7.9)
spring wheat (8.5)
tomatoes (processing)
winter wheat

Underseeding: Do not underseed.

* Sencor + Treflan or Edge, **not** Sencor alone.
** Not on red skinned varieties.
*** In lentils, Sencor may only provide weed suppression rather than control.

4. **Weeds Controlled:** Sencor alone, post-emergent

Chickpea, lentils, field peas, processing peas

ball mustard (8.0)
chickweed (8.1)
corn spurry (7.1)
green smartweed (8.5)
hemp-nettle (8.4)
lady's-thumb
lamb's-quarters (8.4)
stinkweed (8.2)
tartary buckwheat (5.3)
volunteer canola (non-triazine tolerant) (8.8)
wild mustard

Barley, spring wheat

annual smartweeds (8.5)
ball mustard
chickweed (8.1)
common groundsel
corn spurry (7.1)
hemp-nettle (8.4)
henbit (8.0)*
lady's-thumb
lamb's-quarters (8.4)
night-flowering catchfly (sticky cockle)
redroot pigweed (7.1)
Russian thistle (7.2)*
stinkweed (8.2)
tartary buckwheat (5.3)
volunteer canola (8.8)
wild mustard (8.0)
wormseed mustard (8.0)

Winter wheat**

downy brome
flixweed
shepherd's-purse
stinkweed (8.2)

* Apply Sencor at 225 mL/ac (150 g/ac) for control of these weeds.
** Apply Sencor in October or November post-emergent after secondary root development 345 mL/ac to 453 mL/ac (227 g/ac - 304 g/ac).

Potatoes

ball mustard
chickweed (8.1)
corn spurry (7.1)
green smartweed (8.5)
hemp-nettle (8.4)
lady's-thumb
lamb's-quarters (8.4)
redroot pigweed (7.1)
shepherd's-purse
stinkweed (8.2)
tartary buckwheat (5.3)
volunteer canola (8.8)
wild mustard (8.0)

Sencor + Treflan preplant

annual bluegrass
barnyard grass
bromegrass
chickweed
cow cockle
green smartweed
hemp-nettle
knotweed
lady's-thumb
lamb's-quarters
Persian darnel
purslane
redroot pigweed
Russian thistle
shepherd's-purse
stinkweed
volunteer rapeseed
wild buckwheat
wild mustard
wild oats

5. **Weeds Suppressed:** Banvel: Canada thistle (6.6) and sow-thistle; MCPA; or 2,4-D mixes: Barley and wheat. Sencor + Edge: Volunteer barley, Russian thistle in fababean or field peas.

6. **When Used:**

Alfalfa (only irrigated): Sencor: In fall to dormant established stands. Injury may occur if Sencor is applied earlier than 18 months after seeding.

Barley, wheat: Do not use if soil has less than 3% organic matter. Sencor: 2 - 5 leaf. Banvel mix: barley, 2 - 3 leaf; wheat, 2 - 4 leaf. MCPA Amine mix: 3 - 5 leaf. Target mix: barley, 2 - 3 leaf; wheat, 2 - 5 leaf. 2,4-D Amine mix: 3 - 5 leaf.

Chickpea: Apply only up to the 3rd node above ground stage. Application past this growth stage may result in damage to the crop.

Fababeans: Treflan or Edge mix: pre-plant incorporated spring or fall. Do not use on muck soils.

Field peas: Treflan or Edge mix: pre-plant incorporated, spring or fall. Do not use on soils with less than 4% organic matter in fall or 5% in spring.

Lentils: Treflan mix: pre-plant incorporated, fall only. Do not use on soils with less than 4% organic matter.

Lentils, peas (post-emergent): Do not use if soil has less than 4% organic matter. Apply before vines are 15 cm long or before the 6th node stage and after weeds have emerged, but are less than 5 cm in height or diameter. In peas and lentils, use a single post-emergence application or a post-emergence split application. Under certain field or weather conditions, a split application of Sencor may provide better weed control than a single application. The first application should be made at the cotyledon, 2 leaf stage, of the weeds. The second application should be made when a second flush of weeds have emerged or if weeds that were more advanced at the time of the first application have started to regrow. In field peas only, tank mix with MCPA Na-salt at normal post-emergence application timing.

Potatoes: Sencor: post-emergent; before weeds are 4 cm tall. Eptam mix: pre-plant incorporated. Do not use on muck soils. Eptam mix: pre-emerge through sprinkler irrigation system.

Winter wheat (Norstar only): Apply in late fall after winter wheat has commenced tillering and initiated the development of secondary roots. Do not apply to irrigated wheat.

Note: Fall application of Sencor + Treflan or Edge is not recommended where soil drifting is a problem.

7. **How to Apply:**

Lentils, peas: Do not apply within 3 days after periods of cool, wet or cloudy weather as crop injury may occur. Plant lentils and peas at least 5 cm below the soil surface.

With: Ground equipment. Sencor can be affected by dusty conditions, particularly from wheel tracks; therefore, when these conditions are present, spray early in the day when dew will reduce dust. Slower sprayer speed will lower dust levels.

Rate:

Barley, Wheat

Sencor 500 F (75 DF)	Barley mL/ac (g/ac) + mL/ac	Klondike, Leduc, Johnston, AC Lacombe, TR128, Manley barley mL/ac (g/ac) + mL/ac	Spring wheat mL/ac (g/ac) + mL/ac
Alone	110 - 225 (80 - 150)	110 - 170 (80 - 110)	110 - 170 (80 - 110)
+ 2,4-D Amine	110 - 225 (80 - 150) + 345 - 445	Not Recommended	110 - 170 (80 - 110) + 345 - 445
+ Banvel 480	110 - 170 (80 - 110) + 93	Not Recommended	110 - 170 (80 - 110) + 93
+ MCPA Amine	110 - 225 (80 - 150) + 345 - 445	110 (80) + 345 - 445	110 - 170 (80 - 110) + 345 - 445
+ Target	110 - 170 (80 - 110) + 405 - 605	Not Recommended	110 - 170 (80 - 110) + 405 - 605

Sencor (cont'd)

Crop	Sencor 500 F (mL/ac)	Sencor 75 DF (g/ac)	Tank mixes
Alfalfa (only irrigated)	910	610	No mixes
Chickpea (post-emergent)	170	110	No mixes
Lentils (post-emergent)	170	110	No mixes
(post-emergent, split application)	85 - 110 + 85 - 110	55 - 75 + 55 - 75	No mixes
Peas (pre-plant)	170 - 225	110 - 150	See below
(post-emergent)**	113	77	MCPA Na-salt, 190 mL/ac
(post-emergent, one application)	170 - 225	110 - 150	No mixes
(post-emergent, split application)	85 - 110 + 85 - 110	55 - 75 + 55 - 75	No mixes
Potatoes (pre-plant)*	225 - 345	150 - 225	Eptam 8-E, 1.70 - 2.2 L/ac
(pre-emergent irrigation)	225 - 450		Eptam 8-E, 1.70 - 2.2 L/ac
(post-emergent)*	225	150	Sencor alone
Winter wheat	345 - 500	225 - 300	Sencor alone

* Not on red skinned or any early maturing varieties.
** Refer to Pea Pack.

Fababean – Spring, Pre-plant Application

	Sandy soils		Loam to clay soils	
	Organic matter		Organic matter	
Sencor 500 F (75 DF)	**2 - 3%**	**3 - 6%**	**6 - 10%**	**10 - 15%**
Alone	170 mL/ac (110 g/ac)	225 mL/ac (150 g/ac)	225 - 345 mL/ac (150 - 225 g/ac)	345 mL/ac (225 g/ac)
+ Edge DC	+ 560 g/ac	+ 560 g/ac	+ 770 g/ac	+ 770 g/ac
+ Treflan 545 EC	+ 610 mL/ac	+ 610 mL/ac	+ 810 - 1,050 mL/ac	+ 810 - 1,050 mL/ac
Fababean – Fall, Pre-plant Application				
Alone	225 mL/ac (150 g/ac)	285 mL/ac (190 g/ac)	285 - 345 mL/ac (190 - 225 g/ac)	345 mL/ac (225 g/ac)
+ Edge DC	+ 770 g/ac	+ 770 g/ac	+ 930 g/ac	+ 930 g/ac
+ Treflan 545 EC	+ 810 mL/ac	+ 810 mL/ac	+ 1,050 - 1,300 mL/ac	+ 1,050 - 1,300 mL/ac

Field peas – Spring, Pre-plant Application

	Sandy soils	Loam to clay soils	
	Organic matter	Organic matter	
Sencor 500 F (75 DF)	**4 - 6%**	**6 - 10%**	**10 - 15%**
Alone	225 mL/ac (150 g/ac)	225 - 285 mL/ac (150 - 190 g/ac)	285 mL/ac (190 - 225 g/ac)
+ Edge DC	+ 560 g/ac	+ 770 g/ac	+ 770 g/ac
+ Treflan 545 EC	+ 610 mL/ac	+ 810 - 1,050 mL/ac	+ 810 - 1,050 mL/ac
Field peas – Fall, Pre-plant Application			
Alone	285 mL/ac (190 g/ac)	285 - 345 mL/ac (190 - 225 g/ac)	345 mL/ac (225 g/ac)
+ Edge DC	+ 770 g/ac	+ 930 g/ac	+ 930 g/ac
+ Treflan 545 EC	+ 810 mL/ac	+ 1,050 - 1,300 mL/ac	+ 1,050 - 1,300 mL/ac

Lentils – Fall, Pre-plant Incorporated

Sencor 500 F (75 DF)	Sandy soils Organic matter 4 - 6%	Loam to clay soils Organic matter 6 - 15%
Alone	285 mL/ac (190 g/ac)	285 - 345 mL/ac (190 - 255 g/ac)
+ Treflan 545 EC	+ 810 mL/ac	+ 1,050 - 1,215 mL/ac

Water volume:

Barley, spring wheat, winter wheat, soybean, fababean: 40 L/ac.

Chickpea, lentils, peas: 70 L/ac.

Potatoes, asparagus: 40 - 120 L/ac.

Higher rates of water increase crop tolerance.

Pressure: 200 - 275 kPa.

Nozzles: Tilt nozzles 45° forward for better spray penetration in post-emergent applications.

Screens: Use 50 mesh or larger nozzle screens or metal filters. Do not use felt filters.

Incorporation:

Sencor + Eptam: On potatoes, see *Eptam*.

Sencor + Treflan: On fababeans and field peas: Apply and incoporate in the same operation if possible. Must be incorporated within 24 hours. Work twice in different directions. Use a tandem disc, discer or vibrashank type cultivator to cut 8 - 10 cm deep. Operate disc implements at 7 - 10 km/h; cultivators at 10 - 13 km/h.

With irrigation:

Sencor + Eptam: Potatoes: pre-emergence in sprinkler irrigation. Apply specified dosage in 3 - 8 mm of water per acre on a continuous injection in centre pivot systems, or in the last 15 - 30 minutes of set in permanent solid set sprinkler system of self-propelled wheel move systems. On sandy soil, apply in 3 - 5 mm of water and use the lower rate of Sencor and Eptam. Apply pre-emergence to crop and weeds. Use the higher rate for control of grassy weeds or when broadleaf weeds are dense.

8. **Application Tips:** Allow 4 - 5 days between application of Sencor and post-emergent wild oat herbicides. Allow 4 - 5 days after frost for crop to recover before applying Sencor. Weed control may be reduced if Sencor is applied later than the 5 leaf stage of crop. Crop may be sprayed when wet with dew. Crop must be planted at least 5 cm below soil surface.

Sencor + Treflan: Cultivate to destroy existing weeds before application. On stubble fields, chop and thoroughly mix crop residues into soil to a depth of 10 - 15 cm. Disc type implements provide the best results. To avoid concentrating wild oat seeds below the treated layer and causing soil erosion, do not plow (moldboard) land prior to application. On variable soils with light, sandy areas, some injury may occur on the sandy areas if the rate used is for loam-clay soils. On soils with 10% organic matter and higher, broadleaf weed control may not be adequate. Do not apply to wet soils or soils subjected to periods of flooding. Do not incorporate with a field cultivator when the soil is crusted, lumpy or too wet for good mixing action.

Sencor post-emergence: For optimum weed control, it is important to apply Sencor post-emergent when weeds have just emerged and are very small. Crop tolerance is not affected by early application.

How it Works: A systemic herbicide absorbed by leaves and roots and translocated to new growth. Inhibits photosynthesis and the weed turns brown and dies.

Expected Results:

Broadleaf weeds: Initial yellowing 5 - 7 days after application; weeds turn brown and die within 14 - 16 days. Active in soil for a short period and can control new shallow-rooted germinants, like chickweed.

Sencor (cont'd)

Crops: In extremely hot weather or when frost occurs within 1 - 2 days of application, crop will show some yellowing and slight reduction in height. Discolouration disappears in 7 - 10 days. On Klondike, Johnston, AC Lacombe and Leduc barley varieties, temporary lightening in colour and reduction in height may occur. Lentils and peas provide little competition against weed growth due to their low growth habit. Under heavy weed infestations or lush growth, control may be poor.

Field peas and lentils: Stress such as disease, cold, deep planting, excessive moisture, high salts or drought may weaken seedlings and increase the possibility of damage. Temporary lightening on the margins of cotyledons and a slight delay in development may occur. Ensure 70 L/ac water volume is used to reduce crop injury.

11. **Effects of Rainfall:** Rainfall within 6 hours after application may reduce weed control.
12. **Movement in Soil:** Little leaching occurs in soils with high organic matter.
13. **Cropping Restrictions:** Do not graze or feed treated crop to livestock within 30 days of application (lentils, peas: 70 days).

    Application to harvest interval (days): Grain (60); potatoes (60); lentils, peas (70).

    Succeeding crops: 24 months are required for crops other than potatoes if 910 mL/ac (610 g/ac) is applied on irrigated alfalfa. Canola, celery, cole crops, cucurbits, lettuce, onions, peppers, spinach, sugar beets, sunflowers, table beets and turnips may be injured if planted in soil treated with Sencor during the year of application and the following crop year. Fall seeded or cover crops such as wheat, oats, and rye may be injured when seeded in the same season as the application of Sencor. For pre-plant applications of Sencor + Treflan or Edge, oats, sugar beets, creeping red fescue and small-seeded grasses (e.g. timothy, canary seed) should not be planted the following crop year as a precaution.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 1,100 - 2,300 mg/kg. Slightly toxic to fish and birds.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** No damage by freezing but avoid large temperature fluctuations. Store in a cool, dry place.

    Note: A similar product is Lexone.
17. **Resistance Management:** Sencor is a Group 5 herbicide. Any weed population may contain or develop plants naturally resistant to Sencor and other Group 5 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Spectrum *(florasulam + MCPA + clopyralid)*

Group 2,4

Manufacturer: **Dow AgroSciences Canada Inc.**

1. **Formulations: Spectrum A:** 50 g/L Florasulam SC; 0.8 L jug and **Spectrum B:** 50 g/L clopyralid + 280 g/L MCPA Ester EC, 12.0 L jug.

2. **Registered Mixes:**

Barley, durum, spring wheat: Assert 300 SC + acidulate, Puma^{120} Super (312 mL/ac for barnyard grass, green foxtail and wild oats). **Durum, spring wheat:** Everest 70 DF solupak (17.4 g/ac) + non-ionic surfactant, Horizon (95 mL/ac) + Score adjuvant.

3. **Crops:** Barley, oats, spring wheat (including durum).

4. **Weeds Controlled:**

- Canada thistle (8.0)
- chickweed (8.8)
- cleavers (8.8)
- flixweed
- hemp-nettle (8.2)
- lamb's-quarters (8.9)
- redroot pigweed (8.6)
- shepherd's-purse (8.9)
- smartweed (8.8)
- annual sowthistle (8.8)
- stinkweed(8.9)
- stork's bill (8.1)
- volunteer canola (8.9) (all canola)
- wild buckwheat (8.6)
- wild mustard (9.0)

5. **Weeds Suppressed:** Dandelion (seedlings and overwintered rosettes less than 15 cm) (8.4), perennial sowthistle (7.6).

6. **When Used:**

Crop stage: Apply to actively growing spring wheat, barley or oats. Apply when the majority of the crop is past the 2 leaf stage and up to the 6 leaf stage of the crop. When tank mixing, always check the tank mix partners' recommendations for crop staging restrictions.

Weed stage: Annual broadleaf weeds: 1 - 4 leaf stage, except flixweed, which is best controlled in the 2 - 4 leaf stage. Canada thistle and perennial sow-thistle: after all thistles have emerged and when the majority are in the rosette to pre-bud stage.

7. **How to Apply:**

With: Ground equipment only. With a sprayer that can apply 40 L/ac spray solution. Do not apply by air.

Rate: Spectrum A: 40 mL/ac; Spectrum B: 600 mL/ac.

Water volume: 40 L/ac.

Pressure: Use low pressures, 200 to 275 kPa.

Nozzles: Use nozzles that deliver higher volumes and coarser droplets.

Mixing instructions: Only use sprayers with good agitation. Ensure that the sprayer is properly cleaned prior to adding Spectrum.

1. Fill the sprayer tank 1/2 full with water.
2. Start the sprayer agitation and continue agitation throughout mixing and spraying procedure.
3. Add Spectrum A herbicide to the spray tank followed by Spectrum B. Add the required tank mix partner and the adjuvant recommended for that partner. Complete the filling of the spray tank.

Sprayer cleanup:

1. Immediately after application, drain the sprayer.
2. Rinse the inside of the tank with clean water, and flush through the booms and hoses using at least 10% of the spray tank volume and then drain spray tank completely.
3. Add 1 liter of household ammonia per 100 L of water while filling the tank with clean water. Agitate and then briefly flush the boom and hoses with the cleaning solution. Top up the tank with water and allow to stand 15 minutes with agitation. Flush boom and hoses and drain the tank completely.
4. Remove nozzles and screens and clean separately with ammonia solution (100 mL/10L water).
5. Rinse the tank with clean water and flush through the booms using at least 10% of the spray tank volume and then drain the tank.

8. **Application Tips:** Do not apply to crops underseeded to legumes. Apply Spectrum early post-emergence, to the main flush of broadleaf weeds. Warm, moist conditions that promote active weed growth, small weed size and a competitive crop as well as good growing conditions after application will optimize the weed control provided by Spectrum. Weeds hardened off by cold weather or drought stress may not be adequately controlled or suppressed and regrowth may occur. For best results, ensure adequate spray coverage of the target weeds. Only weeds emerged at time of application will be controlled. If the foliage of the weed is wet at time of application, control may be reduced.

Spectrum (cont'd)

9. **How it Works:** Spectrum tank mix is readily absorbed by the weed foliage. The florasulam inhibits the ALS enzyme in plants, resulting in rapid stopping of growth followed by yellowing and reddening of the foliage, followed by the death of susceptible weeds. The Curtail M portion of Spectrum mimics naturally occurring plant hormones and controls the weeds by disrupting normal plant growth patterns. Symptoms include twisting of stems and swollen nodes.
10. **Expected Results:** The weeds susceptible to florasulam will stop growing almost immediately. The weeds turn yellow or reddish. Symptoms such as yellowing and red coloration may not be noticeable for 1 - 2 weeks. Twisting of stems may also be observed on weeds sensitive to Curtail M. Warm, moist conditions, small weed size and a competitive crop will optimize weed control provided by Spectrum
11. **Effects of Rainfall:** Heavy rainfall immediately after application may wash the chemical off the foliage, and a repeat treatment may be required. Do not apply if rainfall is expected within 6 hours.
12. **Movement in Soil:** Florasulam is not persistent in the soil. Dissipation of florasulam occurs primarily through microbial degradation. Field studies in a wide-variety of soils have shown the half-life of florasulam in soil to range from 2 - 18 days. Florasulam degradation is not affected by soil type or by soil pH, but it is moisture and temperature-dependent. The herbicide is somewhat soluble in water, but is generally not mobile in soil under typical prairie conditions. The clopyralid portion of Curtail M is somewhat soluble in water, but is generally not mobile under typical prairie conditions. MCPA is readily leached from the soil.
13. **Cropping Restrictions:**

    Grazing restrictions: Do not graze treated crop or cut for feed within 7 days of application.

    Drift: Do not allow spray mist to drift since drift can cause damage to non-target crops and plants. Do not apply when winds are gusty or in excess of 15km/h. When spraying, avoid combinations of pressure and nozzle type that will result in fine particles (mist), which are more likely to drift.

    Succeeding crops: Fields treated with Spectrum herbicide tank mix can be seeded the following year to barley, canola, peas, wheat or summerfallowed. Do not seed crops other than those listed above for at least one year after treatment. For more cropping and use information, contact your Dow AgroSciences Canada Inc. representative.

    Other restrictions: Do not harvest the treated mature crop within 60 days of application.
14. **Toxicity:** Spectrum A has extremely low acute toxicity. Acute LD_{50} = >6,000 mg/kg. Spectrum B (Clopyralid and MCPA) has very low acute toxicity. Acute LD_{50} rats = >2,000 mg/kg. MCPA has moderate acute toxicity. Acute LD_{50} of technical = (700 - 800 mg/kg).
15. **Precautions, First Aid:** Do not get in eyes, on skin or on clothing. Wear impervious gloves, coveralls and chemical workers' goggles during the mixing and handling of Spectrum. Wash thoroughly after handling. Wash contaminated clothes before reuse. Destroy contaminated shoes and leather articles.

    If in eyes, irrigate immediately with water for at least 5 minutes. **If on skin**, wash off in flowing water or shower; use soap if available. **If inhaled**, remove person to fresh air. Consult a physician. **If swallowed**, do not induce vomiting. Call a physician. The decision of whether to induce vomiting or not should be made by an attending physician. Never give fluids or induce vomiting if patient is unconscious or is having convulsions. Take container label or product name and Pest Control Product registration number with you when seeking medical attention.
16. **Storage:** Store away from food, feedstuffs, fertilizer, seeds, insecticides, fungicides or other pesticides or herbicides. Store in a dry, heated storage. If products are frozen, bring to room temperature and agitate before use. Soak up small amounts of spill with absorbent clays.
17. **Resistance Management:** Spectrum is both a Group 2 and a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Spectrum and other Group 2 and 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Stampede EDF *(propanil)*

Manufacturer: **Dow AgroSciences Canada Inc.**

Group 7

CAUTION POISON

1. **Formulations:** Extruded dry flowable; 80%; 10 kg.
2. **Registered Mixes:** Stampede EDF should **not** be used alone. Always apply as a tank mix with 2,4-D or MCPA or Refine Extra + surfactant.

   Mixing instructions: Add 1/2 required amount of water to spray tank and start agitation. Slowly add Stampede EDF. Then add 2,4-D or MCPA. Add remainder of water.
3. **Crops:** Barley (8.4), canary seed, durum wheat (8.7), flax (8.4), oats (8.9), spring wheat (8.8).
4. **Weeds Controlled:**

Stampede EDF alone: green foxtail, redroot pigweed

Stampede EDF + MCPA (Ester or Amine): Barley, canary seed, flax, wheat. Oats (Ester only)

bluebur* (7.8)
flixweed* (7.4)
green foxtail (7.1)
kochia* (6.7)
lady's-thumb
lamb's-quarters (8.7)
redroot pigweed (8.8)
shepherd's-purse (9.0)
smartweeds (8.6)
stinkweed* (8.7)
tartary buckwheat (8.6)
volunteer canola
volunteer rapeseed (8.8)
wild buckwheat (7.1)
wild mustard (7.5)
yellow foxtail

Stampede EDF + 2,4-D (Amine or Ester): Wheat

annual smartweeds
annual sunflower
bluebur*
burdock*
cocklebur
flixweed*
goat's-beard*
green foxtail
kochia*
lady's-thumb
lamb's-quarters
narrow-leaved hawk's-beard*
plantain
prickly lettuce
redroot pigweed
Russian pigweed
Russian thistle (7.5)
shepherd's-purse
stinkweed
sweet clover
tartary buckwheat
volunteer rapeseed
wild buckwheat
wild mustard (7.3)
wild radish
yellow foxtail

Stampede EDF + Refine Extra and surfactant: Barley, oats, wheat (including durum)

chickweed
green foxtail
hemp-nettle
lamb's-quarters
redroot pigweed
Russian thistle
smartweed
volunteer canola
wild buckwheat
wild mustard
yellow foxtail

* In seedling or rosette stage.

5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Stampede + MCPA: Cereals 2 - 5 leaf stage only. Flax: 5 - 12.5 cm tall, Canary seed: 2 - 4 leaf stage. Stampede + 2,4-D: Wheat 3 - 5 leaf stage only. Refine Extra mix: Cereals: 2 - 5 leaf stage.

   Weed stage: Green foxtail: when the majority of plants are in the 3 leaf stage (less than 2.5 cm tall), effectiveness declines rapidly after the 5th leaf. Under dry conditions (soil moisture deeper than 5 cm), apply when green foxtail is in the 2 - 3 leaf stage.

   Bluebur, kochia, flixweed, hawk's-beard, shepherd's-purse, stinkweed: seedling or rosette stage. Other broadleaf weeds: 1 - 4 leaf stage.
7. **How to Apply:**

   With: Ground equipment only. Spra-coupe not recommended. Do not apply by air.

   Rate:

   Stampede EDF: 0.5 kg/ac.

   MCPA Amine or Ester 500: 325 mL/ac; 2,4-D Amine 500: 325 mL/ac, 2,4-D Ester 600: 270 mL/ac (spring wheat).

Stampede EDF (cont'd)

MCPA Ester 500: 225 mL/ac; 2,4-D Amine 500: 325 mL/ac, 2,4-D Ester 600: 270 mL/ac (durum wheat).

MCPA Ester 500: 225 mL/ac (barley, oats, canary seed, flax).

Refine Extra plus surfactant: 8 g/ac + 0.2 L/100 L of spray volume (wheat, durum, barley, oats).

Surfactant: any non ionic surfactant such as Companion, Citowett Plus, Ag-Surf or Agral 90.

Water volume: Field sprayers: 45 L/ac. Floater type equipment: 65 L/ac.

Pressure: 275 kPa.

Nozzles: Only flat fan nozzles and 50 mesh screens.

Ground speed: 8 km/h for field sprayers, 20 km/h or less for floaters.

8. **Application Tips: Temperature effects:** Do not spray crops when daily temperatures remain below 10°C or when they are expected to exceed 30°C. Under hot, dry and low relative humidity conditions, spray during early morning or evening. Avoid spraying if crop is recovering from frost damage or if frost is expected within 24 hours.

   Drain and flush sprayer tank and lines after spraying is completed. Do not apply Stampede EDF to crops grown in fields in which Atrazine or other triazine herbicides (such as Lexone, Sencor, Bladex, Blagal, Marksman, Simadex, Princep, Laddok) have been applied until soil analysis confirms that the residues have completely disappeared. A 3 day interval is required before or after an application of Stampede EDF and another herbicide.

   Insecticide intervals: Severe crop injury may result from a tank mix or separate applications of Stampede EDF and certain insecticides in the same crop year (e.g. Sevin (carbaryl), parathion methyl or Guthion). Decis may be applied any time before or after Stampede EDF or tank mixed with Stampede EDF. After applying Stampede EDF, wait a minimum of 5 days for wheat and 10 days for barley before applying Furadan. After applying Stampede EDF, wait a minimum of 14 days before applying dimethoate (Cygon) or Malathion. No other insecticides are registered for foliar use in the same year as Stampede EDF. Do not spray with Stampede EDF if the field was treated with soil-applied systemic organophosphorous insecticides in the same or previous crop year.

9. **How it Works:** Absorbed by leaves and causes cell wall breakdown and interference with the cellular metabolism. Activity is primarily contact; therefore, thorough spray coverage is necessary for optimum weed control. Susceptible weeds become tolerant beyond the 4 leaf stage. Stress conditions will trigger a hardening- off process and hasten the development of tolerance to chemical control.

10. **Expected Results:**

    Weeds: Affected weeds turn brown in 3 - 5 days and have a "burnt-off," or desiccated appearance. Weeds past the recommended stage will show extensive browning, but some degree of green tissue remains. New tissue is produced, and the weed will recover. Weeds emerging after spraying are unaffected.

    Crops: Temporary yellowing and leaf tip burn occur and are more pronounced in oats, flax and barley than in wheat. Effects will disappear 10 - 14 days after treatment. New growth is not affected and yields are not reduced. Under stress conditions, a slight delay in crop maturity may be noticed.

11. **Effects of Rainfall:** Light rainfall 1 hour after application does not reduce weed control. A heavy rain of 25 mm or more within 4 hours of application may reduce control.

12. **Movement in Soil:** Propanil is relatively non-mobile.

13. **Cropping Restrictions:** Do not graze the treated crop or cut for hay; sufficient data are not available to support such use.

    Drift: Danger is low; however, avoid spray drift to susceptible crops such as rapeseed, sunflowers, vegetables or ornamentals.

14. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 560 mg/kg, Stampede EDF = 3,130 mg/kg. Propanil has potential to cause chlorachne, a skin disease in man following long-term exposure.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Giddiness, intoxication and headache.

16. **Storage:** Heated storage not required.
17. **Resistance Management:** Stampede EDF is a Group 7 herbicide. Any weed population may contain or develop plants naturally resistant to Stampede EDF and other Group 7 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Sundance *(sulfosulfuron)*

Group 2

Manufacturer: **Monsanto Canada Inc.**

1. **Formulations:** Water dispersible granule; 75%; 1 x 432 g pouches Sundance + 1 x 8 L Merge + 1 x 4 L pH Balancer.
2. **Registered Mixes:**

Tank mix partner	Tank mix partner rate
2,4-D LV Ester 500	356 mL/ac
2,4-D LV Ester 600	283 mL/ac
2,4-D LV Ester 700	243 mL/ac
Buctril M	400 mL/ac
MCPA Ester 500	388 mL/ac
Pardner EC	400 mL/ac

Mixing instructions:

1. Fill the spray tank 3/4 full and start agitation.
2. First adjust the pH of the spray water prior to any mixing of Sundance herbicide by adding 1 L of pH Balancer for every 400 L of spray solution. This will ensure that after the Sundance herbicide granules are added, they will be completely dissolved.
3. Slowly add Sundance granules (10.8 g/ac).
4. Add the broadleaf herbicide. Add Merge (200 mL/ac) and complete the filling process while maintaining agitation.
5. Maintain an air gap during filling and remove the hose from the mixing tank immediately after filling to avoid siphoning back into the carrier source.
6. Spray solutions should be applied immediately. If spraying is interrupted, sufficient agitation must be conducted to completely re-suspend any precipitated product.

3. **Crops:** Durum wheat (Kyle and Plenty), spring wheat.

Sundance (cont'd)

4. Weeds Controlled:

Sundance 10.8 g/ac (alone)

- cleavers
- common chickweed
- foxtail barley
- redroot pigweed
- stinkweed
- volunteer canola (excluding CLEARFIELD)
- wild mustard
- wild oats

Additional weeds controlled when 2,4-D Ester is added

- dandelion
- green smartweed
- kochia
- lady's-thumb
- lamb's-quarters
- narrow-leaved hawk's-beard
- perennial sow-thistle
- stork's-bill
- volunteer canola (CLEARFIELD)
- wild buckwheat

Additional weeds controlled when MCPA Ester is added

- burdock
- cocklebur
- common plantain
- common ragweed
- flixweed
- kochia
- lamb's-quarters
- mustards (except dog, tansy)
- narrow-leaved hawk's-beard
- prickly lettuce
- Russian pigweed
- shepherd's-purse
- stork's-bill
- sunflower
- wild radish

Additional weeds controlled when Pardner EC is added

- American nightshade
- bluebur
- cocklebur
- common buckwheat
- common groundsel
- common ragweed
- cow cockle
- green smartweed
- kochia*
- lady's-thumb
- lamb's-quarters
- narrow-leaved hawk's-beard
- pale smartweed
- pigweed
- Russian thistle
- tartary buckwheat
- wild buckwheat

Additional weeds controlled when Buctril M is added

- dandelion
- flixweed
- green smartweed
- hemp-nettle
- kochia*
- lady's-thumb
- lamb's-quarters
- mustards (except dog, tansy)
- scentless chamomile**
- shepherd's-purse
- stinkweed
- volunteer canola
- wild buckwheat

* Spray before plants are 5 cm high.
** Spring annuals only.

5. Weeds Suppressed: Sundance + Merge: Barnyard grass, dandelion, green foxtail, perennial sow-thistle, quackgrass. Sundance + MCPA + Merge: Canada thistle, dandelion, green foxtail, green smartweed, perennial sow-thistle, quackgrass, wild buckwheat.

6. When Used:

Crop stage: Wheat: Before the fourth tiller.

Weed stage: Wild oats: Up to the 6 leaf stage and no later than the 3 tiller stage. For optimum performance and yield response, apply prior to tillering of wild oats. For annual broadleafs, seedling weeds are controlled much easier than larger weeds. Perennial weeds should be treated prior to the flower stage and during a period of active growth.

7. How to Apply:

With: Ground equipment only.

Rate: Sundance: 10.8 g/ac + Merge: 200 mL/ac

Water volume: 23 - 45 L/ac. Always use clean water, free of sediments.

Pressure: 275 kPa.

Nozzles: Flat fan recommended.

Sprayer cleanup: To avoid subsequent injury to crop other than wheat, immediately after Sundance herbicide use and prior to spraying other crops, thoroughly clean all mixing and spraying equipments as follows:

1. Drain tank; then flush tank, boom and hoses with clean water for a minimum of ten minutes. Visually inspect tank to ensure removal of all visible residues of Sundance herbicide. It may be necessary to repeat Step 1.

2. Fill the tank with clean water, add one litre of household ammonia (containing minimum of 3% ammonia) per 100 litres of water. Flush solution through boom and hoses and then add more water to ensure tank is completely filled. Allow to sit for 15 minutes with agitation. Again flush the hoses, booms and nozzles with clean solution and drain tank.
3. Remove nozzles and screens and clean separately in a bucket containing cleaning agent and water.
4. Repeat Step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

Incorporation: Not applicable.

8. **Application Tips:** For optimum control, apply Sundance to actively growing weeds. Early application (prior to the first tiller of wild oats) will maximize crop yields by reducing weed competition. Do not apply Sundance to wheat stressed by conditions such as frost, low fertility, drought, flooding, disease or insect damage because crop injury may result.
9. **How it Works:** Sundance is a systemic herbicide that is translocated to the growing points in plants. Sundance inhibits cell division rapidly.
10. **Expected Results:** Growth is inhibited rapidly. Symptoms will be observed in 4 - 5 days. However, complete kill will not be observed until 14 - 25 days after treatment.
11. **Effects of Rainfall:** Rainfall within 2 hours after application may reduce performance.
12. **Movement in Soil:** Movement of this herbicide in soil is minimal.
13. **Crop Restrictions:**

    Greater than 4% Organic Matter: Sundance herbicide-treated wheat fields with soil organic matter of 4% or greater may be rotated to the following crops the year after treatment: all wheat varieties including durum, canola, barley, peas and flax. In areas where fields may have been affected by extreme drought or drought conditions and high soil pH (pH 7.5 and greater) between application and soil freeze-up, injury to crops other than wheat or CLEARFIELD canola may be observed within the recommended plantback timing interval.

    Less than 4% Organic Matter: Sundance herbicide-treated wheat fields with organic matter less than 4% may be rotated to the following crops the year after treatment: all wheat varieties including durum, and imazethapyr tolerant canola, i.e. CLEARFIELD canola. In the **second** year after treatment (22 months after application), the following crops may be planted: wheat, durum wheat, barley, canola, peas or flax. In areas where fields may have been affected by extreme drought or drought conditions and high soil pH (pH 7.5 and greater), between application and soil freeze-up, injury to crops other than wheat or CLEARFIELD canola may be observed within the recommended plantback timing interval.
14. **Toxocity:** Acute oral LD_{50} (rats) = >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store under cool, dry conditions (below 50°C). Do not store under moist conditions.
17. **Resistance Management:** Sundance is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Sundance and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Target/Sword *(MCPA + mecoprop + dicamba)*

Group 4

CAUTION POISON

Manufacturer: Syngenta Crop Protection Canada Inc./United Agri Products

1. **Formulations:** Liquid; 275 g/L MCPA + 62.5 g/L mecoprop + 62.5 g/L dicamba; 2 x 10 L pack.
2. **Registered Mixes:** Horizon (95 or 115 mL/ac + Score, wheat), Afolan F (barley, wheat), Lorox L (barley, wheat), Sencor (barley, wheat), Linuron 480 (wheat, barley).
3. **Crops:**

annual canary seed (9.0)
barley (8.5)
durum wheat (8.8)
hard red spring wheat (8.4)
oats (9.0)
summerfallow (thistle control)
winter wheat (8.6)

Seedling and established grasses grown for forage

creeping red fescue
crested wheatgrass
intermediate wheatgrass
meadow foxtail
orchard grass
smooth bromegrass
timothy

Additional established grasses grown for forage:

Kentucky bluegrass
meadow bromegrass
meadow fescue
slender pubescent
tall fescue
tall wheatgrass
western wheatgrass

4. **Weeds Controlled:**

annual smartweeds (8.0)
annual sow-thistle
ball mustards
chickweed*
cleavers (7.5)
common ragweed
corn spurry (8.8)
cow cockle (8.5)
flixweed (8.5)
hemp-nettle
knotweed
kochia (8.0)
lady's-thumb
lamb's-quarters (8.7)
night-flowering catchfly (7.5)
prostrate pigweed (8.5)
redroot pigweed (8.5)
Russian thistle (8.5)
shepherd's-purse
stinkweed (8.8)
tartary buckwheat (8.5)
volunteer buckwheat
volunteer mustards
volunteer rapeseed (9.0)
volunteer sunflowers (8.3)
wild buckwheat (8.5)
wild mustards (8.8)
wormseed mustards

* Only in tank mix with Afolan F, Lorox L and Sencor.

5. **Weeds Suppressed:** Canada thistle (6.6), field bindweed, hedge bindweed, perennial sow-thistle.
6. **When Used:** Annual canary seed, durum wheat, oats, spring wheat: 2 - 5 leaf stage. Barley: 2 - 4 leaf stage. Winter wheat: apply in spring before crop is more than 30 cm tall. Seedling grasses grown for forage: 2 - 4 leaf stage. Weed growth stage: 2 - 5 leaf stage. Cleavers (1 - 2 whorl), hemp-nettle (before second pair of true leaves). Russian thistle (less than 5 cm). Summerfallow: Canada thistle is in the early bud stage. Post harvest (stubble): Canada thistle actively growing 15 - 20 cm, do not apply within 2 weeks of a killing frost.
7. **How to Apply:**

With: Ground or air.

Rate: 400 - 600 mL/ac. For Canada thistle, cleavers, field bindweed, hedge bindweed, hemp-nettle, perennial sow-thistle, volunteer canola, winter annuals: 600 mL/ac. Summerfallow: 800 mL/ac. Post harvest (stubble): 800 mL/ac.

Water volume: Ground: 40 L/ac. Air: 12 L/ac (minimum).

Pressure: 200 - 300 kPa.

Nozzles: Flat fan recommended.

8. **Application Tips:** Use the higher rate when weeds are beyond the 3 leaf stage, when weed densities are high, when weeds are not actively growing due to extended periods of hot and dry or cold and wet weather prior to application or for control of overwintering fixweed, shepherd's-purse and stinkweed. In winter wheat, spray winter annuals as soon as growth begins in spring. Do not let contents stand for long periods. Agitate every 8 hours.
9. **How it Works:** A combination of 3 systemic hormonal herbicides that accummulate in the growing point of susceptible plants, produce abnormal growth and disrupt the transport system in plants.

10. **Expected Results:**

Weeds: Can take up to 7 - 14 days depending on weather and growing conditions. Leaves curl, leaf edges turn brown, petioles twist, plant ceases growth and turns brown and dies.

Crop: Improper or untimely application can result in abnormal bending at the nodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels and sterile florets. Under certain conditions, straw shortening may occur but yield will not be affected. **Poor results may be expected if there is poor coverage, rainfall less than 3 hours after application or weeds are too advanced.** Dicamba containing products can be hard on crops if incorrectly applied.

11. **Effects of Rainfall:** Rainfall within 3 hours will reduce activity.

12. **Movement in Soil:**

MCPA/mecoprop: Readily mobile in the soil.

Dicamba: Relatively mobile; mobility affected by capillary movement and/or surface evaporation. Concentration and location in the soil profile will be determined by total seasonal precipitation, its frequency and original herbicide dosage.

13. **Cropping Restrictions:** Do not graze or harvest for livestock feed within 7 days of application. Most vegetables and fruit crops are very sensitive to drift. Cereal and broadleaf crops can be grown the year following application.

14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = MCPA 100 - 500 mg/kg, mecoprop = 930 mg/kg, dicamba = 2,629 mg/kg, Target = 1,600 mg/kg. Non-toxic to fish. Toxic to bees.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Heated storage only.

17. **Resistance Management:** Target/Sword is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Target/Sword and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Telar *(chlorsulfuron)*

Group 2

Manufacturer: **DuPont Canada Inc.**

CAUTION POISON

1. **Formulations:** Dry flowable; 75%, 500 g (5 x 100 gram water soluble bags).

2. **Registered Mixes:** Telar Toss-N-Go (48 g/ac) + Krovar I (2.75 - 3.6 kg/ac + surfactant); Telar Toss-N-Go (6 g/ac) + 2,4-D Amine (.32 - .45 L/ac) or 2,4-D Ester (.24 - .32 L/ac).

Surfactants: Ag-Surf, Agral 90, Citowett plus, Companion, Super Spreader.

Suggested sequentials: Atrazine, Hyvar X, Hyvar X-L, Karmex DF, Krovar I, Princep, Spike, or Velpar.

Telar (cont'd)

Mixing instructions: Fill the spray tank 1/4 - 1/3 full with clean water. Add the recommended number of Telar Toss-N-Go bags to the spray tank while agitator is running. Continuous agitation is required to keep Telar herbicide in suspension. After Telar Toss-N-Go Bags have fully dissolved and Telar is in suspension, other tank mix components may be added while continuing to full the tank with water. The proper sequence for tank mix components is as follows:

1. dry formulations,
2. emulsifiable concentrates,
3. surfactants.

If a drift control agent is to be tank mixed, it is to be added last.

For repeat loads, reduce the tank heel to 10% or less of the previous load. Fill tank with clean water as described in step 1, and continue as directed. Emulsifiable concentrates may make dispersion of Telar more difficult. For that reason, tank heels of the previous tank mix should be kept to 10% or less of the spray tank volume. Do not allow the spray mixture to remain in the tank for more than 24 hours before spraying, or the effectiveness may be reduced. If the spray mixture has been allowed to stand in the tank, use vigorous agitation to thoroughly disperse before resuming spraying.

3. **Crops:** Non-crop land such as lumber yards, petroleum tank farms, plant sites, railroads and storage areas where the object is to achieve and maintain control of all vegetation.

4. **Weeds Controlled:**

Telar at 6 g/ac + 2,4-D

annual sunflower
ball mustard
common ragweed
cow cockle
flixweed
green smartweed
hemp-nettle
kochia
lady's-thumb
lamb's-quarters
narrow-leaved hawk's-beard (spring seedlings)
plantain
prickly lettuce
redroot pigweed
Russian pigweed
Russian thistle
shepherd's-purse
stinkweed
stork's-bill
sweet clover
volunteer rapeseed
wild mustard

Telar alone at 12 g/ac

blue bur
chickweed
common groundsel
corn spurry
cow cockle
flixweed
green smartweed
hemp-nettle
lady's-thumb
lamb's-quarters
redroot pigweed
scentless chamomile
shepherd's-purse
stinkweed
stork's-bill
volunteer rapeseed
wild mustard

Telar alone at 16 g/ac

Weeds controlled at 12 g/ac, plus wild carrot

Telar alone at 28 g/ac

Weeds controlled at 16 g/ac, plus common tansy kochia Russian thistle sweet clover

Broadleaf weed control in non-crop land (where vegetation is not desirable).

This rate of Telar Toss-N-Go Bags may cause severe injury for certain grass species.

Telar alone at 48 g/ac

Weeds controlled at 28 g/ac, plus
Canada thistle
dandelion
horsetail
narrow-leaved hawk's-beard
wild buckwheat

5. **Weeds Suppressed:**

Telar (alone) 28 g/ac: Canada thistle, dandelion, golden rod, horsetail, perennial sow-thistle, wild rose, wild strawberry.

Telar (alone) 48 g/ac: Golden rod, perennial sow-thistle, wild rose, wild strawberry, willow.

6. **When Used:**

Weed stage: Apply when weeds are small (less than 10 cm tall). Under adverse conditions the addition of a recommended surfactant at 1 L/1,000 L spray solution may improve control of weeds.

7. **How to Apply:**

   With: Ground equipment. Do **not** apply by air.

   Rate: Alone at 12, 16, 28 or 48 g/ac. At 6 g/ac when tank mixing with 2,4-D and at 28 g/ac when tank mixing with Krovar I.

   Surfactant: 1 L/1,000 L spray solution.

   Water volume: Not less than 40 L/ac. Spray volumes of 80 - 160 L/ac are recommended.

   Pressure: 275 kPa.

   Nozzles: 50 mesh or larger screens. Only metal or nylon filters.

   Sprayer cleanup: If the sprayer is to be used to spray sensitive crops or ornamentals, thoroughly remove all traces of Telar herbicide from the mixing and spray equipment immediately after spraying as follows:

   1. Drain and flush tank, boom and hoses with clean water for a minimum of ten minutes. Visually inspect tank to assure removal of all visible residues of Telar herbicide. If necessary, repeat step 1. Do not clean sprayer near well or water source or near desirable vegetation.
   2. Fill the tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water to completely fill tank. Allow to sit for 15 minutes with agitation. Again, flush the hoses, boom and nozzles with the cleaning solution and drain tank.
   3. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
   4. Repeat step 2.
   5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips:** Select a spray volume that will ensure thorough coverage and uniform spray pattern. Best results are obtained when weeds are actively growing.
9. **How it Works:** Absorbed through the roots and foliage. Inhibits cell elongation.
10. **Expected Results:** Telar rapidly inhibits growth of susceptible weeds. Typical symptoms (discolouration) of dying weeds may not be noticeable for 1 - 3 weeks after application depending on growing conditions and weed susceptibility. Degree of control and duration of effect depend on the following factors: rate used, weed sensitivity and weed size, growing conditions at and following treatment, precipitation, soil organic matter and pH.
11. **Effects of Rainfall:** Rainfall within 2 hours may lessen degree of weed control. Residual control of weeds germinating after spray application as achieved when Telar herbicide is carried into the root zone by rainfall. For best results, sufficient rainfall to move Telar 5 - 7 cm deep into the soil is required after application, before weeds develop an established root system and grow beyond the seedling stage.
12. **Movement in Soil:** Movement is restricted by finely textured soils, soil organic matter and neutral-to-acidic conditions.
13. **Cropping Restrictions:** For use on non-crop land only.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 5,919 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27) for further information. Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place. Telar Toss-N-Go Bags are dry flowable granules contained within a water soluble film. The water soluble film dissolves readily in water. Reseal unused Toss-N-Go Bags into cardboard cylinder when not in use.

Telar (cont'd)

17. **Resistance Management:** Telar is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to Telar and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Thumper *(bromoxynil + 2,4-D)*

Group 6,4

Manufacturer: **Bayer CropScience**

WARNING POISON

1. **Formulations:** Emulsifiable concentrate; 280 g/L bromoxynil + 280 g/L 2,4-D; 2 x 8 L jugs.
2. **Registered Mixes:** Achieve 80DG (barley, wheat); Avenge (barley, spring wheat); Horizon (spring wheat, durum wheat); Puma^{120} Super (barley, spring wheat, durum wheat). Refer to Achieve 80DG label for mixing instructions.
3. **Crops:** Barley, durum wheat, spring wheat.
4. **Weeds Controlled:**

American nightshade
ball mustard
bluebur
cocklebur
common buckwheat
common groundsel
common ragweed
cow cockle
flixweed
green smartweed
kochia
lady's-thumb
lamb's-quarters
night-flowering catchfly
pale smartweed
redroot pigweed
(triazine resistant)
Russian thistle
shepherd's-purse
stinkweed
tartary buckwheat
volunteer canola
volunteer sunflower
wild buckwheat
wild mustard

5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Barley, durum wheat, spring wheat: 4 leaf to early flag leaf.

   Weed stage: Up to 4 leaf stage. Buckwheats, groundsel, lamb's-quarters, stinkweed, wild mustard: up to 8 leaf stage. Kochia, Russian thistle: up to 5 cm high. Velvet leaf: up to 8 cm high.
7. **How to Apply:**

   With: Aircraft or ground equipment.

   Rate: 405 mL/ac.

   Water volume: Air: 8 L/ac or more. Ground: 20 - 40 L/ac.

   Pressure: 275 kPa.

   Nozzles: Flat fan recommended. Hollow cone (air only).
8. **Application Tips:** Do not treat cereals underseeded with forages. For best results, spray when weeds are in the seedling stage and actively growing. Application before the 4 leaf stage may injure the crop.
9. **How it Works:** Bromoxynil is a contact type herbicide; therefore, good spray coverage is essential. Inhibits photosynthesis and plant respiration. 2,4-D is a hormone type herbicide which causes abnormal growth, affects respiration, food reserves and cell division in broadleaf plants. Absorbed primarily by leaves and stems and translocated to the growing tips and roots.
10. **Expected Results:** Small burn spots on the leaf can appear within hours; death takes up to 2 weeks.
11. **Effects of Rainfall:** No effect.
12. **Movement in Soil:** Leaching does not pose a problem.

13. **Cropping Restrictions:** Do not graze of harvest for greenfeed until 30 days after treatment.

    Succeeding crops: No restrictions.

14. **Toxicology:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = 230 mg/kg (active ingredient). Intake of a large dose may cause convulsions, sudden collapse and coma. Can be absorbed through the skin. Very toxic to fish.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Does not require heated storage.

17. **Resistance Management:** Thumper is both a Group 4 and a Group 6 herbicide. Any weed population may contain or develop plants naturally resistant to Thumper and other Group 4 and 6 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Tordon 22K *(picloram)*
Tordon 101 Mixture *(picloram + 2,4-D)*

Group 4

Manufacturer: **Dow AgroSciences Canada Inc.**

CAUTION POISON

Note:

Tordon 22K: Rangeland and pasture applicaitons. Does not require a licenced pesticide applicator.

Tordon 101: **Available only to authorized pesticide applicators**.

1. **Formulations:** Solution: Tordon 22K; 240 g/L; 3.6 L and 10 L jug: Tordon 101 Mixture; 65 g + 240 g/L; 10 L.
2. **Registered Mixes:** Tordon 101 plus Sodium TCA, Tordon 101 plus Sylgard.
3. **Crops:**

   Tordon 22K: Permanent grass pastures, rangeland, spot treatment on cultivated cropland, utility rights-of-way.

   Tordon 101 mixture: Non-crop areas (utility rights-of-way).

4. **Weeds Controlled:**

   Tordon 22K:

   Group 1: Scentless chamomile.

   Group 2: Diffuse knapweed, spotted knapweed.

   Group 3: Canada thistle, pasture sage, poverty weed, Russian knapweed, sow-thistle.

   Group 4: Field bindweed, leafy spurge, toadflax.

Tordon 22K/Tordon 101 Mixture (cont'd)

Tordon 101 mixture:

Brush: Alder, birch, cedar, maple, pine, poplar, spruce and other species.

Weeds: Burdock, Canada thistle, common ragweed, dandelion, dock, goldenrod, fleabane, plantain, prickly lettuce, red clover, sweet clover, vetch, wild carrot.

5. **Weeds Suppressed:** None.
6. **When Used:**

Tordon 22K: Any time when, green fully developed leaves are present.

Tordon 101 mixture:

Brush: After foliage is well developed. Unsatisfactory results may occur if applications are made when foliage has lost its normal green colour.

Weeds: Spring or early summer after growth appears.

7. **How to Apply:**

Tordon 22K: Boom, handgun or backpack.

Tordon 101 mixture: Ground equipment or helicopter using drift control system or agent.

Rate:

Tordon 22K	Tordon 22K per 100m²
Group 1: 445 mL/ac	Group 1: 11 mL
Group 2: 910 mL/ac	Group 2: 22 mL
Group 3: 1.8 L/ac	Group 3: 45 mL
Group 4: 3.6 L/ac	Group 4: 90 mL
Tordon 101 mixture	
Brush: 7.3 - 10 L/ac (ground); 10 - 14 L/ac (air) Weeds: 2.8 L/ac	

Water volume:

Tordon 22K: 160 - 324 L/ac.

Tordon 101 mixture: 80 L/ac.

Nozzles: Flat fan recommended.

8. **Application Tips:** Tordon 22K used as a spot treatment in a crop. No spot treatment should exceed 1 acre, and the total area treated in any 1 field in a year should not exceed 5% of the field.

Note: Picloram is extremely persistent and water soluble. Small quantities may cause damage to desirable plants. Do not apply or permit any Tordon to contaminate soil used to grow desirable, susceptible plants. Do not contaminate water used for irrigation or domestic purposes.

9. **How it Works:** Interferes with cell division, causing leaf cupping, stem distortion and eventual death of plant. Tordon 101 and 22K are absorbed through leaves and roots.
10. **Expected Results:**

Tordon 22K: Perennial weeds show distorted stems and cupped leaves, which turn yellow and then brown. Usually native grass increases in abundance as a result of reduced competition.

Tordon 101 mixture: 2 - 3 weeks after the first rainfall after treatment, leaves of affected trees become dull and cupped; orange streaks appear on stems of poplar trees and leaves become brown and brittle as the tree dies. **Poor results may be expected if** there is heavy rainfall immediately after treatment on light sandy soil.

11. **Effects of Rainfall:** Heavy rainfall may carry picloram away from the target area.
12. **Movement in Soil:** Picloram is very soluble in water and moves with water in coarsely textured soils.
13. **Cropping Restrictions:** Do not graze dairy animals in treated area within 6 weeks after treatment. For Tordon 101, withdraw meat animals from treated fields 3 days prior to slaughter. Manure from picloram treated vegetation should not be used to grow sensitive crops but rather be returned to a cereal crop field. When applied as a spot treatment on cropland, picloram may persist in soil for up to 5 years and prevent the establishment of sensitive crops.

    Succeeding crops:

    1st year: Oats.

    2nd year: Oats or barley.

    3rd year: Oats, barley or wheat. A reduction in yield in the 1st year is usually offset by benefits of weed control obtained. Legumes may not be established in a pasture for several years after a Tordon treatment. If legumes are essential in a pasture, do not use Tordon.
14. **Toxicity:** Tordon 22K = >5,000 mg/kg; Tordon 101 = 2,598 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Tordon 22K: Store in a cool, dry place. Do not freeze. If freezing occurs, bring to room temperature and mix thoroughly. Tordon 101 Mixture: Store in a cool, dry place.
17. **Resistance Management:** Tordon 22K/Tordon 101 Mixture is both a Group 4 and a Group 6 herbicide. Any weed population may contain or develop plants naturally resistant to Tordon 22K/Tordon 101 Mixture and other Group 4 and 6 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Touchdown iQ *(glyphosate)*

Group 9

Manufacturer: Syngenta Crop Protection Canada Inc.

1. **Formulations:** Water soluble liquid: 360 g/L acid equivalent (present as 480 g/L diammonium salt); 10 L jug, 450 L tote.
2. **Registered Mixes:**

    Minimum tillage: Pardner

    Summerfallow: Dicamba, 2,4-D amine

    Non-ionic surfactants: Agral 90, Ag-Surf, Frigate, Companion, Enhance.
3. **Crops:** Fall stubble treatment, minimum or zero tillage, non-crop areas, pasture renovation, pre-plant or pre-seed application in direct seeding systems, spot treatment (in-crop), summerfallow.

Touchdown iQ (cont'd)

4. Weeds Controlled:

Annuals – Grasses

annual bluegrass
barnyard grass
downy brome
giant foxtail
green foxtail
Persian darnel
tame rye grass
volunteer barley
volunteer wheat
wild oats
yellow foxtail
volunteer corn

Annuals – Broadleaf

annual sow-thistle
black nightshade
Canada fleabane
common chickweed
common ragweed
crabgrass
dodder
flixweed
hairy galinsoga
hemp-nettle
kochia
lady's-thumb
lamb's-quarters
low cudweed
narrow-leaved hawk's-beard
narrow-leaved vetch
prickly lettuce
prostrate knotweed
redroot pigweed
Russian thistle
shepherd's-purse
stinkweed
stork's-bill
volunteer canola
volunteer corn
volunteer flax
wild buckwheat
wild mustard
yellow nutsedge

Perennials – Grasses

Canada bluegrass
Canada Kentucky bluegrass
common redtop
foxtail barley
orchard grass
quackgrass
round-leaved mallow
smooth bromegrass
wire stem mulhy

Perennials – Broadleaf

absinth
alfalfa
broadleaf plantain
Canada goldenrod
Canada thistle
cattail
common dandelion
common milkweed
colt's foot
cottontop
curled dock
field bindweed
grass-leaved stitchwort
hemp dogbane
hoary cress
horsetail
Japanese knotweed
Jerusalem artichoke
mouse-eared chickweed
perennial sow-thistle
poison ivy
sheep's sorrel
smooth bedstraw
toadflax
white clover
wild carrot
wild grape
wormwood

5. Weeds Suppressed: Some weeds suppressed at lower rates.

6. When Used:

Annual weeds: Grassy and broadleaf weeds at least 15 cm tall and actively growing.

Perennial weeds: Canada thistle (bud stage): At or beyond bud stage of growth.

Canada thistle (rosette stage): Ensure the majority of the rosettes are a minimum of 15 cm in diameter.

Field bindweed: Full bloom stage or beyond.

Milkweed: Bud to full bloom for most shoots.

Quackgrass (spring application, no fall tillage): 3 - 4 green leaves or approximately 20 cm in height.

Quackgrass (spring application, fall-tilled land): 4 - 5 green leaves or approximately 20 cm in height.

Quackgrass (fall application, after harvest): 3 - 4 green leaves or approximately 20 cm in height.

Other perennial weeds: At the early heading or early bud stage.

7. How to Apply:

With: Ground equipment only. Boom (ground boom) and boomless equipment, knapsack sprayers, hand held and high volume equipment; wiper, wick and roller equipment.

Annual Weed Control			
Weeds controlled	**Growth stage**	**Rate (L/ac)**	**Comments**
Green foxtail, lady's-thumb, stinkweed, volunteer cereals, wild mustard, wild oats.	Weeds up to 8 cm in height	0.30	For wild oats, apply at 1 - 3 leaf stage. Add 350 mL of a registered surfactant (Agral 90 or Ag-Surf). For heavy wild oat infestation, use heavy rates. No additional surfactant is required.
All annual grasses listed above plus foxtail barley* (suppression only). All annual broadleaf weeds listed above plus flixweed** and kochia**.	Weeds 8 - 15 cm	0.40	Add 350 mL of surfactant registered for use as listed above. * Apply before initiation of seed head or senescence of lower leaves. ** Suppression only.
All annual grasses listed above plus downy brome, giant foxtail, Persian darnel. All annual broadleaf weeds listed above plus Canada fleabane*, common ragweed, flixweed, hemp-nettle, kochia, lamb's-quarters, narrow-leaved hawk's-beard***, redroot pigweed, Russian thistle, volunteer flax, wild buckwheat**.	Weeds up to 15 cm in height	0.51 - 0.77	No additional surfactant is required. * Do not use these rates on plants greater than 8 cm in height. ** For 3 - 4 leaf stage, use higher rate. *** For weeds 8 - 15 cm cm in height, use heavy rate.
All annual grasses listed above plus crab grass and annual bluegrass. All annual broadleaf weeds listed above plus annual sow-thistle, kochia, narrow-leaved vetch, prickly lettuce, and shepherd's-purse.	Weeds up to 15 cm in height	0.91	For additional broadleaf weed control options, refer to tank mix section on the label.
All annual grasses and broadleaf weeds listed above.	Weeds over 15 cm in height	1.41	For additional broadleaf weed control options, refer to tank mix section on the label.

Touchdown iQ (cont'd)

Annual Weed Control Tank Mixtures for Summerfallow

Tank mixture	Weeds controlled	Rate (L/ac) TD iQ plus tank mix partner	Comments
Touchdown iQ plus Dicamba 480 g/L	Cow cockle, green foxtail, flixweed*, kochia, lamb's-quarters, lady's-thumb, stinkweed, redroot pigweed**, Russian thistle, volunteer cereal, volunteer canola (excluding glyphosate tolerant), wild buckwheat**, wild oats.	0.30 - 0.40 plus 0.12	Apply in 20 - 40 L/ac of water. Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height. * Use higher rates of Touchdown iQ. ** Suppression only.
Touchdown iQ plus 2,4-D amine[1]	Green foxtail*, flixweed*, kochia, lamb's-quarters, lady's-thumb, stinkweed, redroot pigweed**, Russian thistle, volunteer cereal, volunteer canola (excluding glyphosate tolerant), wild buckwheat**, wild oats*.	0.30 - 0.40 plus 0.49	Apply in 20 - 40 L/ac of water. Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height. * Use higher rates of Touchdown iQ for wild oat and green foxtail control. ** Suppression only.
Touchdown iQ plus Pardner	Green foxtail, kochia**, lamb's-quarters, lady's-thumb, stinkweed, redroot pigweed**, Russian thistle, volunteer cereal, volunteer canola (excluding glyphosate tolerant), wild buckwheat*, wild oats**	0.30 - 0.40 plus 0.50	This tank mixture is registered for use in summerfallow and prior to seeding or after seeding, but before crop emergence in wheat, barley and oats in direct seeding systems. Apply in 20 - 40 L/ac of water. Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height. * Use higher rates of Touchdown iQ for wild buckwheat control. ** Suppression only.

[1] 0.56 kg ai/ha of 2,4-D. Adjust rates accordingly for other 2,4-D formulations.

Perennial Weed Control

Weeds controlled	**Growth stage**	**Rate (L/ac)**	**Water vol.**	**Comments**
Canada thistle	Bud stage or beyond	1.9 - 2.9	100 - 300	Allow 5 days after application before tillage. Heavy frost prior to application may decrease control.
	Rosette stage (summerfallow)	1.0	50 - 100	Perform the last summerfallow tillage operation between July 5 and August 1. Allow regrowth for a minimum of 5 weeks to reach rosette stage and a minimum of 15 cm in diameter. Allow 10 days after application before tillage. Treatment after mild frost is possible if leaves are still green and actively growing.
Field bindweed	Full bloom or beyond	2.8 - 4.9	100 - 300	Allow 7 days or more after application before tillage.
Common milkweed	Bud to full bloom for most shoots	4.9	100 - 300	Spot treatment rate is 95 mL/100 m^2 and spray to wet.
Quackgrass *spring application (no fall tillage)*	3 - 4 green leaves; approx. 20 cm high	1.0	50 - 300	Season-long control. For higher water volume, use approved surfactant at 0.5% v/v. Allow 3 days after application before tillage.
spring application (fall tilled land)	4 - 5 green leaves; approx. 20 cm high	1.0	50 - 100	Season-long control. Apply in spring prior to seeding. Growth stage usually reached 1 - 4 weeks later on fall tilled land.
fall application	3 - 4 green leaves; approx. 20 cm high	1.0		Season-long control the following year. Do not till between harvest and application. Allow 5 days or more after application before tillage.
	3 - 4 green leaves; approx. 20 cm high	1.0 - 2.9		Long-term control. Treatment after mild frost is possible if 3 - 4 leaves are still green and actively growing.

(continued)

Touchdown iQ (cont'd)

Perennial Weed Control *(continued)*

Perennial Weed Control

Weeds controlled	**Growth stage**	**Rate (L/ac)**	**Water vol.**	**Comments**
Wire stemmed muhly, alfalfa, broadleaf plantain, Canada goldenrod, horsetail, mouse eared chickweed, sheep sorrel, wild grape		0.7 - 1.4	100 - 300	Use higher rates for weeds beyond 8 cm in height or in heavy weed infestation. Allow 7 days after application before tillage.
Dandelion, round-leafed mallow, smooth bedstraw, stork's-bill, white clover, wild carrot		1.4 - 2.3	100 - 300	Use higher rates for weeds beyond 8 cm in height or in heavy weed infestation. Allow 7 days after application before tillage.
Other perennial weeds	Early heading or early bud stage	2.3 - 3.9	100 - 300	Use higher rates for weeds beyond 8 cm in height or in heavy weed infestation. Allow 7 days after application before tillage.

Note: The following grasses and broadleaf weeds require a use rate of 0.7 - 1.5 L/ac. Wire stemmed mulhy, alfalfa, broadleaf plantain, Canada goldenrod, horsetail, mouse-eared chickweed, sheep's sorrel and wild grape. All other perennial grasses and broadleaf weeds require a use rate of 1.5 - 2.3 L/ac. These include common redtop, orchard grass, colt's foot dandelion, grass-leafed stitchwort, Jerusalem artichoke, round-leaved mallow, smooth bedstraw, stork's-bill, white clover and wild carrot.

Water volume: Handgun, high volume (coarse spray only): 80 - 120 L/ac. Boom: 40 - 120 L/ac. Chemical fallow, reduced rates: 20 - 40 L/ac.

Pressure: 275 kPa.

Nozzles: Flat fan nozzles for volumes 20 - 40 L/ac. Flood jet type or flat fan for volumes above 40 L/ac.

8. **Application Tips:** Tillage or mowing prior to application will reduce effectiveness on perennial weeds. Minimum (days) to wait before tillage after Touchdown applications: Quackgrass spring application (3); fall application (5); Canada thistle bud stage (5); Canada thistle rosette stage (10); field bindweed, milkweed, other perennials (7). Reduced results may occur if water containing soil is used, such as water from ponds and ditches. Poor control may also occur when treating weeds heavily covered with dust.

   Quackgrass control: Spring and fall treatments in annual and forage cropping systems: Apply to actively growing quackgrass. Reduced control may result if rhizomes become dormant. This may occur due to poor sod or land has not been tilled for several years. For fall application, straw should be removed or evenly spread to allow regrowth and adequate spray coverage. Treatment after a mild frost is possible if 3 - 4 leaves are still green and actively growing, but not after a heavy frost. For spring application on fall tilled ground, delay application until the majority of quackgrass have 4 - 5 green leaves. This stage is usually reached 1 - 4 weeks later than on undisturbed ground.

   Canada thistle (fall rosette): Conduct summerfallow tillage as usual and perform the last tillage operation from July 5 to August 1. Allow thistles to regrow for a minimum of 5 weeks until they are 15 cm in diameter and the majority of them are in a rosette stage. Treatment after mild frost is possible if leaves are still green and actively growing, but not after heavy damaging frost.

9. **How it Works:** A non-selective, systemic herbicide that moves from the foliage into the roots and kills the entire plant.

10. **Expected Results:** Gradual wilting and yellowing of the plant that advances to complete browning of above ground growth, and deterioration of underground plant parts occurs. For annuals, this result occurs within 2 - 4 days; perennials require 7 - 10 days. Extremely cool and cloudy weather may slow activity of this product and delay visual effects of control.

11. **Effects of Rainfall:** Do not apply if rainfall is forecast for the time of application.
12. **Movement in Soil:** The amount of glyphosate leaching is very low.
13. **Cropping Restrictions:** Do not graze or harvest treated areas.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD$_{50}$ (rats) = 1,298 - 1,760 mg/kg. Eye irritant. Non-toxic to bees, birds and fish.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning Clothing and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Heated storage not required.
17. **Resistance Management:** Touchdown iQ is a Group 9 herbicide. Any weed population may contain or develop plants naturally resistant to Touchdown iQ and other Group 9 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Preharvest – Touchdown iQ

Application can be made prior to the harvest of wheat for the control of quack grass, Canada thistle, common milkweed and season-long control of perennial sow thistle.

Crop: Barley, oats, wheat, canola, flax (including low linolenic acid varieties), lentils, peas, soybean and drybean. **Do not** apply to crops grown for seed.

Rate: 1 L/ac.

With: Ground equipment only. **Do not apply by air.**

Water volume: 20 - 40 L/ac.

Crop timing: Apply when seed moisture is less than 30%. An accurate evaluation and measurement of seed moisture content must be made before pre-harvest application. This stage typically occurs 7 - 14 days before harvest. Consult table below to review visual indicators for each crop.

Weeds controlled: Quack grass, Canada thistle, common milkweed and season-long control of perennial sow-thistle and annual weeds.

Application tips: This treatment may also provide harvest management benefits by drying down crop and weed vegetative growth, for example, where late flushes of annual weeds, green vegetative crop growth or late tillering may interfere with harvest operations. Extremely cool and/or cloudy weather conditions between the time of application and the anticipated harvest date may slow down activity of this product, thereby delaying crop drydown and harvest date. For best weed control results, quackgrass should be actively growing and have at least 4 - 5 green leaves; Canada thistle and perennial sow-thistle should be actively growing and at or beyond the bud stage. Applications for weed control (not harvest management) must be made at the correct stage of both weed and crop growth. Apply only during the period 7 - 14 days before harvest to ensure best weed control and maximize the harvest management benefits. Earlier application may reduce crop yield and/or quality, and may lead to excess glyphosate residues on the crop.

Glyphosate Tolerant Canola

Crop: Canola varieties with Roundup Ready Gene. Note: Always use pedigreed (i.e. certified) glyphosate tolerant canola seed. Canola, that is not designated as glyphosate tolerant will be damaged or destroyed by this treatment.

Touchdown iQ (cont'd)

Weeds controlled, growth stage and rate:

Crop	Rate	Weeds controlled
Annual weeds	0.33 - 0.50 L/ac	Chickweed, cleavers*, corn spurry, cow cockle*, green foxtail hemp-nettle, kochia, lady's-thumb, lamb's-quarter, night-flowering catchfly*, non-glyphosate tolerant canola, redroot pigweed, Russian thistle, shepherd's-purse*, smartweed, stinkweed, volunteer barley, volunteer wheat, wild buckwheat*, wild mustard, wild oats, wild tomato
Perennial weed suppression	0.5 L/ac	Canada thistle, dandelions, perennial sow-thistle, quackgrass (season-long control)
Perennial weed season-long	Repeat application at 0.5 L/ac	Canada thistle, perennial sow-thistle

* Use 0.5 L/acre rate for the control of these weeds at all crop growth stages The lower rate can be used for control of cow cockle and night-flowering catchfly at 1-3 leaf stage of crop or for control of smartweed at 4 - 6 leaf stage.

Application tips:

Repeat applications may be required if second flush of weeds germinates prior to canopy closure. Ensure crop has not advanced beyond the recommended growth stage. A short term visual yellowing may occur when Touchdown iQ is applied at the late application 4 - 6 leaf stage of the crop. This effect is temporary and will not influence crop growth, maturity or yield.

Rate: 0.33 - 0.50 L/ac. No addition surfactant is required.

With: Ground application only**. Do not apply by air.**

Water volume: 20 - 40 L/ac.

Crop stage: 0 - 6 leaf stage.

Grazing or Cropping restrictions. Do not graze the treated crop or cut for hay; sufficient data are not available to support such use. Make preharvest applications at least 7 days before harvest.

Transline *(clopyralid)*

Available to Industrial Application Only

Group 4

CAUTION POISON

Manufacturer: Dow AgroSciences Canada Inc.

1. **Formulations:** Solution; 360 g/L; 4.45 L jug.
2. **Registered Mixes:** 2, 4-D Ester and Amine, MCPA Ester and Amine.
3. **Crops:** Balsam fir Christmas tree stands or plantations, non-crop areas, rangeland or grass pasture, right-of-ways, roadsides, storage sites, industrial manufacturing sites.
4. **Weeds Controlled:** Alsike clover, Canada thistle, common groundsel, common ragweed, perennial sow-thistle (top growth control), scentless chamomile, vetch, wild buckwheat.
5. **Weeds Suppressed:** Ox-eye daisy, sheep sorrel.
6. **When Used: Non-crop land:** Canada thistle, perennial sow-thistle, scentless chamomile: between rosette and pre-bud stage. Common ragweed: 5 - 10 cm in height. Vetch: when stems are 10 - 15 cm long. Wild buckwheat: 2 - 6 leaf. All other weeds prior to 15 cm height. Apply when weeds are actively growing with adequate soil moisture.

Rangeland or grass pasture: Seedling grasses at 2 - 4 leaf stage. For established grasses, apply at shot blade stage or in fall after harvest or early spring. Do not apply tank mixes containing 2,4-D or MCPA.

Balsam fir Christmas tree stands or plantations: Apply when vetch stems are 10 - 15 cm long and prior to the vetch climbing into the tree crown. Do not use on seedbeds, transplants or any over-the-top applications. Do not apply tank mixes containing 2,4-D or MCPA.

7. How to Apply:

Crop	Rate	Weeds controlled
Non-crop	170 mL/ac	Alsike clover, Canada thistle (suppression of top growth for 6 - 8 weeks), vetch (*Vicia* spp.).
	227 mL/ac	Canada thistle (season-long top growth control) common groundsel, common ragweed, ox-eye daisy (suppression), perennial sow-thistle (top growth control), scentless chamomile, sheep sorrel (suppression), wild buckwheat.
	336 mL/ac	Canada thistle (season-long control of top growth with a reduction in population in the following year).

Tank mix with 170 - 225 g/ac (active ingredient) 2,4-D or MCPA Amine or Ester for additional weed control on roadsides or vacant lots.

Tank mix with 170 - 225 g/ac (active ingredient) 2,4-D Amine for additional broadleaf control on right-of-way and associated station, industrial manufacturing sites and storage sites.

Rangeland and pasture	Rate	Weeds controlled
Creeping red fescue, Kentucky blue grass, meadow foxtail, reed canary grass, smooth bromegrass	170 mL/ac	Alsike clover, Canada thistle (suppression of top growth for 6 - 8 weeks), vetch (*Vicia* spp.)
Altai wild ryerass, crested wheatgrass, intermediate wheatgrass, orchard grass, Russian wild ryegrass, slender wheatgrass, streambank wheatgrass, tall wheatgrass, timothy	227 mL/ac	Common groundsel, common ragweed, Canada thistle (season-long top growth control), ox-eye daisy (suppression), perennial sow-thistle (top growth control), scentless chamomile, sheep sorrel (suppression), wild buckwheat
Meadow fescue, tall fescue.	336 mL/ac	Canada thistle (season-long control of top growth with a reduction in population in the following year)
Only one application per season Do not tank mix with MCPA or 2,4-D		
Christmas tree stands or plantations		
Balsam fir	170 mL/ac	Vetch

8. Application Tips: Non-crop areas. Make sure the sprayer tank has been cleaned thoroughly before Transline is mixed. Treat during warm weather when weeds are actively growing. Best results are obtained when Canada thistle is actively growing and soil moisture is adequate for rapid growth. Under cool or dry conditions, control of Canada thistle may be severely reduced. Sow-thistle plants emerging after spraying will not be controlled.

Tank mixing Transline with 2,4-D or MCPA Ester or Amine will control many additional weeds (see appropriate 2,4-D and MCPA labels).

Transline (cont'd)

Rangeland and grass pasture: Dilute in 45 - 50 L/ac water. Make only one application per season by ground sprayer. For seedling grasses, apply at 2 - 4 leaf stage. For established grasses, apply at shot-blade stage or in the fall after harvest or in early spring. Do not apply tank mixtures containing 2,4-D or MCPA.

Balsam fir Christmas tree stands or plantations: Dilute in 60 - 80 L/ac water. Apply when vetch is 10 - 15 cm long and before it climbs into tree crown. Avoid contact with upper two thirds of crown. Do not use on seedbeds, transplants or any over-the-top applications. Do not apply tank mixtures containing 2,4-D or MCPA.

9. **How it Works:** Clopyralid is a systemic, hormone-type herbicide. It is absorbed by leaf and stem surfaces and is readily translocated. Maximum efficacy results from foliar application to young, actively growing plants.
10. **Expected Results:** Herbicide symptoms on affected plants include swollen growing points and roots, cupping of leaves, twisted and distorted stems and leaves. Plants will gradually stop growing and change colour, first to dark green and then to yellow before turning brown as they die. Maximum effectiveness results from foliar applications to young, actively growing plants. Death of weeds may not occur until 14 - 21 days after application. With the lowest rate of Transline on Canada thistle, some regrowth may occur by the end of the season.
11. **Effects of Rainfall:** A rain-free period of 4 - 6 hours is required.
12. **Movement in Soil:** Clopyralid is somewhat soluble in water but is generally not mobile in soil under typical prairie conditions.
13. **Cropping Restrictions:**

    Drift: Small amounts of drift may damage sensitive plants such as legumes.

    Succeeding crops: Areas previously treated with Transline can be seeded to barley, canola, forage grass crops, flax, mustard, oats, rapeseed, rye, wheat, or they can be summerfallowed the year after treatment. Do not seed to crops other than those listed above the year after treatment. For more cropping and use information, contact your Dow AgroSciences Canada Inc. representative.

    Grazing restrictions: None. If necessary, forages may be grazed immediately following application.

    Use of manure and straw from treated crops: Transline residues in straw may be harmful to susceptible plants. Do not use straw from treated crops for composting or mulching on susceptible broadleaf crops. Manure can be spread on fields that will be seeded to barley, flax, oats, canola (rapeseed), rye or wheat. Do not grow susceptible crops such as peas, beans, lentils, potatoes, sunflowers or other sensitive crops on land that has been mulched with straw containing Transline residues within the last 12 months.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = >2,000 mg/kg.
    Acute oral LD_{50} (bees) = >100 µg/bee. Extremely low toxicity to fish.
15. **Precautions, First Aid:** Flammable. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlines nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in heated storage away from open flames or sparks. If frozen, warm slowly to room temperature and mix thoroughly before use.
17. **Resistance Management:** Transline is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Transline and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Treflan/Advance/Rival/ Bonanza *(trifluralin)*

Oilseed, Special Crops

Group 3

Manufacturers: **DowAgroSciences/Nufarm Canada/United Agri Products**

1. **Formulations:** Granular: **Advance 10G:** 10.0%; 22.7 kg bag; 454 kg bulk bag. **Bonanza 10G:** 10%; 22.7 kg bag; 500 kg bulk bag. **Rival 10G:** 10%; 22.7 kg; 567 kg bag. **Treflan QR5:** 5%; 25 kg; 725 kg bag. Emulsifiable concentrate: **Bonanza 400:** 400 g/L; 10 L; 115 L; 205 L. **Rival EC:** 500 g/L; 9 L; 110 L; 200 L; 900 L containers. **Treflan EC:** 480 g/L; 9.45 L; 115 L containers. Dry Flowable: **Rival DF:** 60%; 7.5 kg bag.

2. **Registered Mixes:** **Advance 10G/Bonanza 10G/Rival 10G/Treflan QR5:** None.

   Bonanza 400/Rival/Treflan: For oilseeds and special crops: Liquid nitrogen fertilizer (28-0-0); Sencor for T.T.C.

3. **Crops:**

Advance 10G/Bonanza 10G/Rival 10G/Treflan QR5

alfalfa establishment*
canning peas (8.9)
canola (rapeseed) (including triazine tolerant) (8.9)
dry beans
fababeans (8.6)
field peas (8.9)
flax*** (7.7)
lentils** (8.5)
mustard (8.9)
soybeans
sunflowers (8.9)

Bonanza 400

asparagus
black beans
canola (including triazine tolerant)
canning peas
crambe
dry beans (field & kidney)
fababeans
field peas
lentils**
safflower
sainfoin
strawberries
sunflower
sweet clover*****
transplanted shelterbelts******

Rival EC/DF

asparagus (established)
black beans
broccoli
brussels sprouts
cabbage
canning peas
canola
carrots
cauliflower
crambe
dry comon beans (kidney & white)
fababeans
field peas
flax***
lentils**
mustard
peppers
rutabaga
safflower
sainfoin*****
snapbeans
soybeans
strawberries*****
sunflower
sweet clover*****
tomato
transplanted shelterbelts

Treflan EC

alfalfa establishment*
asparagus established
bird's-foot trefoil
black beans
canning peas
canola including triazine tolerant (8.8)
cicer milk vitch
crambe
dry common beans (kidney & white) (8.0)
fababeans
field peas (8.8)
flax***
lentils**
mustard
red clover
safflower
sainfoin
Saskatoon berries
seeding alsike clover
soybeans
sunflower
sweet clover*****
transplanted shelterbelts
vegetables (refer to product label for details)

* Canola and flax cover crops only.
** Fall application only.
*** Summer and fall application only.
**** Fall application only.
***** Spring application only.
****** American elm, caragana, green ash, Siberian elm, Scotch pine.

Underseeding: Not recommended.

Treflan/Advance/Rival/Bonanza – Oilseed, Special Crops (cont'd)

4. **Weeds Controlled:**

annual bluegrass (8.6)
barnyard grass (8.3)
chickweed (7.1)
cow cockle (9.0)
downy bromegrass (5.9)
green foxtail*
knotweed
lamb's-quarters (8.0)
Persian darnel
pigweed (8.2)
purslane (7.9)
wild buckwheat (8.3)
wild oats (7.5)
yellow foxtail (8.1)

* Excluding trifluralin resistant green foxtail.

5. **Weeds Suppressed:** None.
6. **When Used:**

Certain formulations are not registered for all crops listed here. Refer to specific product label for details.

Advance 10G:

Spring: Not recommended.

Summer[1]: Canola (including triazine tolerant), flax. Apply between June 1 and September 1.

Summerfallow[1]: To be seeded the following spring to wheat. Apply between May 1 and September 1.

Fall[1]: Alfalfa establishment, canola (including triazine tolerant), dry beans, fababeans, flax, lentils, mustard, peas, soybeans, sunflowers. Apply between September 1 and prior to soil freeze-up.

Bonanza 10G:

Spring: Not recommended.

Summer[1]: Canola (including triazine tolerant), dry beans, fababeans, flax. Apply between June 1 and September 1.

Summer or fall[1]: On stubble or summerfallow to be seeded the following spring to wheat. Apply between May 1 and September 1.

Fall[1]: Alfalfa establishment, canola (including triazine tolerant), fababeans, flax, lentils, mustard, peas, sunflower, soybeans. Apply between September 1 and prior to soil freeze-up.

Rival 10G:

Spring: Not recommended.

Summer[1]: Canola, fababeans, flax, lentils, mustard, sunflower. Apply to summerfallow between June 1 and September 1.

Fall[1]: Canola (including triazine tolerant), fababeans, mustard, peas, sunflower. Apply between September 1 and soil freeze-up.

Treflan QR5:

Spring: Not recommended in Alberta.

Summer: Canola (including triazine tolerant), flax. Apply between June 1 and September 1.

Fall[1]: Alfalfa, beans (dry only), canola (including triazine tolerant), fababeans, flax, lentils, mustard, peas, soybeans, sunflowers. Apply between September 1 and soil freeze-up.

Bonanza 400:

Spring: Alsike clover, asparagus, bird's-trefoil, blackbeans, broccoli, cabbage, canola (including triazine tolerant), carrots, cicer milk vetch, crambe, fababeans, forage legumes, mustard, peas, red clover, rutabaga, safflower, sainfoin, Saskatoon berries, soybeans, strawberries, sunflowers, sweet clover. Cultivate to destroy existing weeds and apply as a pre-plant treatment.

Summer[1]: On summerfallow to be seeded to canola (including triazine tolerant), flax, safflower. Apply between June 1 and September 1.

Fall[1]: Black bean, dry beans (field and kidney), fababeans, flax, lentils, mustard, peas, soybeans, sunflower. Apply between September 1 and soil freeze-up.

Shelterbelts: Apply prior to transplanting seedlings.

Rival EC/Rival DF:

Spring: Asparagus, beans, broccoli (transplant), brussel sprouts (transplant), cabbage, canola, carrots, cauliflower, crambe, fababeans, forage rape, mustard, peas, peppers, safflower, sainfoin, Saskatoon berries, soybeans, sunflowers, sweet clover, tomatoes, turnips (stubble). Cultivate to destroy existing weeds and apply as a pre-plant.

Summer[1]: Canola, flax, safflower. Apply on summerfallow between June 1 and September 1.

Fall[1]: Beans (black only), canola, flax, lentils, mustard, peas (field), safflower, sunflowers. Apply between September 1 and soil freeze-up.

Shelterbelts: Apply before transplanting.

Treflan EC:

Spring: Alfalfa, beans, canola (including triazine tolerant), crambe, fababeans, mustard, peas, safflower, sainfoin, shelterbelts, sunflowers and sweet clover. Cultivate to destroy existing weeds and apply immediately prior to or up to 3 weeks before planting.

Summer[1]: Canola (including triazine tolerant), flax and safflower. On summerfallow, apply between June 1 and September 1.

Fall[1]: Beans, canola (including triazine tolerant), flax, lentils, mustard, peas, safflower, soybeans, sunflowers. Apply between September 1 and soil freeze-up. Fall application is discouraged where soil drifting is a problem.

[1] Not recommended for fall or summer applications where soil erosion may be a problem.

7. How to Apply:

With: Ground equipment.

Rate – for use in oilseed and specialty crops:

		Soil texture, soil organic matter and soil zones			
		Light (sand to sandy loam)		Medium to heavy (loam to clay)	
Crop	**Season**	**2 - 6 % Organic matter**	**6 - 15% Organic matter**	**2 - 6% Organic matter**	**6 - 15% Organic matter**
Advance 10G					
Canola (including triazine tolerant), flax	Summer	NR	NR	6.9 kg/ac	6.9 kg/ac
Alfalfa establishment, canola (including triazine tolerant), dry beans, fababeans, flax, lentils, mustard, peas	Fall	4.5 kg/ac	5.7 kg/ac	5.7 kg/ac	5.7 - 6.9 kg/ac
Bonanza 10G					
Canola (including triazine tolerant), fababeans, flax	Summer	6.9 kg/ac	6.9 kg/ac	6.9 kg/ac	6.9 kg/ac
Alfalfa establishment, canola (including triazine tolerant), dry beans, fababeans, flax, lentils, mustard, peas	Fall	4.5 kg/ac	5.7 kg/ac	5.7 kg/ac	5.7 - 6.9 kg/ac

(contintued)

Treflan/Advance/Rival/Bonanza – Oilseed, Special Crops (cont'd)

(continued)		Soil texture, soil organic matter and soil zones			
		Light (sand to sandy loam)		Medium to heavy (loam to clay)	
		2 - 6 %	6 - 15%	2 - 6%	6 - 15%
Crop	**Season**	**Organic matter**	**Organic matter**	**Organic matter**	**Organic matter**
Rival 10G					
Canola (including triazine tolerant), flax	Summer	6.9 kg/ac	6.9 kg/ac	6.9 kg/ac	6.9 kg/ac
Alfalfa establishment, canola (including triazine tolerant), dry beans, fababeans, mustard, peas, sunflower	Fall	4.5 kg/ac	5.7 kg/ac	5.7 kg/ac	5.7 - 6.9 kg/ac
Flax, lentils		4.5 kg/ac	5.7 kg/ac	4.5 kg/ac	5.7 - 6.9 kg/ac
Treflan QR5					
Alfalfa establishment, canola (including triazine tolerant), dry beans, fababeans, peas (southern Alberta only)	Spring	NR	NR	NR	NR
Canola (including triazine tolerant)	Summer	NR	13.7 kg/ac	NR	13.7 kg/ac
Alfalfa establishment, canola (including triazine tolerant), dry beans, fababeans, flax, lentils, mustard, peas	Fall	8.9 kg/ac	11.3 kg/ac	11.3 kg/ac	11.3 - 13.7 kg/ac

		Soil texture and soil zones	
Crop	**Season**	**Light (sand to sandy loam)**	**Medium to heavy (loam to clay)**
Bonanza 400			
Asparagus, black beans, canola (including triazine tolerant), canning peas, crambe, dry beans (field & kidney), fababeans, field peas, safflower, sainfoin, soybeans, strawberries, sunflower, sweet clover	Spring	0.8 L/ac	1.11 L/ac
Shelterbelts	Spring	2.22 L/ac	4.44 L/ac
Black beans, canola (including triazine tolerant), dry beans, fababeans, flax, lentils, mustard, peas, soybeans, safflower, sunflower	Fall	1.11 L/ac	1.41 L/ac
Canola (including triazine tolerant), flax	Summer	1.71 L/ac	1.71 L/ac

Crop Rival EC/DF	Season	Soil texture, soil organic matter and soil zones							
		Light (sand to sandy loam)				Medium to heavy (loam to clay)			
		2 - 6% Organic matter		6 - 15% Organic matter		2 - 6% Organic matter		6 - 15% Organic matter	
		Litre/acre							
		Rival EC	Rival DF	Rival EC	Rival DF	Rival EC	Rival DF	Rival EC	Rival DF
All the crops listed for Rival EC/DF except lentils and flax	Spring	0.65	0.52	0.89	0.72	0.89	0.93	0.89 - 1.13	1.13
	Fall	0.89	0.72	1.13	0.93	1.13	0.93	1.13 - 1.3	0.93 - 1.1
Canola, flax	Summer	1.38	1.14	1.38	1.14	1.38	2.9[illegible]	[illegible].38	2.95
Shelterbelts		1.8	1.5	3.6	3.0	3.6	3.0	3.6	3.0
Strawberries		0.89	0.52	0.89	0.73	0.89	0.73	0.89	0.73
Asparagus		0.81	0.69	0.81	0.69	1.2	1.02	1.6	1.34
Flax, lentils	Fall	0.89		1.13		0.89		1.13 - 1.8	

Crop Treflan QR5	Season	Soil zone and soil organic matter	Rates per acre for specific soil texture	
			Light Sand, sandy loam	Medium to heavy Loam, silty clay loam, silt loam, clay loam, silt, silty clay, sandy clay loam, clay
Alfalfa establishment, canola (including triazine tolerant), dry beans, fababeans, peas	Spring	Brown and dark brown (southern Alberta only) 2 - 4% organic matter	NR	NR
Canola (including triazine tolerant)	Summer	Brown, dark brown, black and deep black 2 - 6% organic matter	NR	11.3 - 13.8 kg/ac
Alfalfa establishment, canola (including triazine tolerant), dry beans, fababeans, flax, lentils, mustard, peas	Fall	Brown, dark brown and black 2 - 6% organic matter	8.9 kg/ac	11.3 kg/ac
		Black and deep black 6 - 15% organic matter	11.3 kg/ac	11.3 - 13.8 kg/ac

(contintued)

Treflan/Advance/Rival/Bonanza – Oilseed, Special Crops (cont'd)

(continued)			Rates per acre for specific soil texture	
			Light	Medium to heavy
Crop	Season	Soil zone and soil organic matter	Sand, sandy loam	Loam, silty clay loam, silt loam, clay loam, silt, silty clay, sandy clay loam, clay
Treflan EC				
Alfalfa establishment, black beans, canola (including triazine tolerant), crambe, dry common beans (white & kidney), mustard, peas, safflower, sainfoin, sunflower, sweet clover	Spring	Brown, dark brown and black 2 - 6% organic matter	0.69 L/ac	0.93 L/ac
		Black and deep black 6 - 15% organic matter	0.93 L/ac	0.93 - 1.21 L/ac
Canola (including triazine tolerant), flax, safflower	Summer	Brown, dark brown, black and deep black	NR	1.38 L/ac
Alfalfa establishment, black beans, canola (including triazine tolerant), crambe, dry common beans (white & kidney), mustard, peas, safflower, sainfoin, sunflower, sweet clover	Fall	Brown, dark brown and black 2 - 6% organic matter	0.93 L/ac	1.21 L/ac
		Black and deep black 6 - 15% organic matter	1.21 L/ac	1.21 - 1.37 L/ac

Advance 10G/Treflan QR5:

First incorporation should be in the same direction as application, within 24 hours of application. Second, at right angles to the first, should be delayed a **minimum** of 3 days. This delay allows for greater release and more uniform distribution of trifluralin in the soil.

Implements: A tandem disc, discer or field cultivator (vibrashank) set to cut 5 - 8 cm. Disc implements should be operated at 6 - 10 km/h and cultivator at 10 - 13 km/h. Both incorporations should be completed in the fall.

Summer application: The second (and subsequent incorporations) can be done as necessary to destroy resistant weed growth.

Flax, lentils: Both incorporations must be done in the fall. Fall or summer application should be followed by spring tillage to a 5 - 8 cm depth before seeding.

Bonanza 10G:

First incorporation should be in the same direction as application, within 24 hours of application. Second, at right angles to the first, should be delayed a **minimum** of 5 days. This delay allows for greater release and more uniform distribution of trifluralin in the soil. Both incorporations should be to a depth of 8 - 10 cm.

Implements: Incorporate with disc implements only. Deep tillage cultivators are not recommended. A tandem disc is recommended for the first incorporation. Disc implements should operate at 6 - 10 km/h and cultivator at 10 - 13 km/h.

Summer application: The second (and subsequent incorporations) can be done as necessary to destroy resistant weed growth.

Flax, lentils: Both incorporations must be done in the fall. Fall or summer application should be followed by spring tillage to a 5 - 8 cm depth before seeding.

Rival 10G:

Incorporate 8 - 10 cm. The first incorporation within 24 hours and the second delayed for at least 5 days for more effective weed control. A shallow tillage in the spring, prior to seeding, is required.

Wheat: Summerfallow application: Incorporate to 8 cm. The first incorporation within 24 hours and the second delayed 5 days or until new weed regrowth requires a cultivation or discing. Additional shallow (8 cm) tillage operations may be required to control resistant weed growth.

Flax, lentils: Both incorporations should be done prior to soil freeze-up in the fall. A tandem disc, discer or field (vibrashank) cultivator are recommended for incorporating to 8 - 10 cm. For best mixing action, operate disc implements at 6 - 10 km/h; cultivators at 10 - 13 km/h. Deep tillage cultivators are not recommended.

Bonanza 400:

First incorporation at a right angle, within 8 hours of application. Fall application should follow with 2 incorporations at right angles before freeze up. A tandem disc, discer or field (vibrashank) cultivator is recommended for incorporating to 7.5 - 10 cm. For best results, operate disc implements at 6.5 - 10 km/h; cultivator at 10 - 13 km/h.

Rival EC/DF:

Incorporate 2 - 4 cm with 2 cross harrowings with tyne or diamond harrows operated at a minimum of 9 km/h. Both incorporations should be done within 24 hours of application.

Treflan EC:

First incorporation must be done within 24 hours of application. Second incorporation should be done at right angles to the first.

Fall application: It is recommended that both incorporations be completed in the fall.

Spring application: Apply when soil is in good working condition. Ensure early season flush of weeds is killed by first or second incorporation. Seed into a weed-free seedbed using an accepted cultural practice.

Summer application: The second incorporation (and subsequent incorporations) may be done whenever necessary to destroy resistant weed growth.

Spring tillage: After fall or summer application should be shallow with a disc or field cultivator (vibrashank) set to cut 5 - 8 cm deep. This should be done when soil is warm enough to promote germination. In areas with high wild oat populations, pre-work early in the spring with a shallow cultivation to promote weed seed germination, followed by a 5 - 8 cm deep cultivation prior to seeding to destroy existing green growth. Avoid transplanting weed seedlings, and seed into a weed-free seedbed.

Flax, lentils: Both incorporations of must be done in the fall. Fall or summer application should be followed by spring tillage to a 5 - 8 cm depth before seeding.

Implements: A tandem disc, discer or field (vibrashank) cultivator are recommended for incorporating to 8 - 10 cm. Operate discs at 6 - 10 km/h and cultivator at 10 - 13 km/h. A tandem disc gives the best mixing action on stubble conditions. Do not use a field cultivator to incorporate when soil is crusted, lumpy or too wet for good mixing.

8. **Application Tips:** Do not apply on soils that are wet, in poor tilth or that contain 15% or more organic matter. Do not apply to fields spread with manure during the past 12 months. Ensure that after this period, manure has been thoroughly disintegrated and mixed into the soil. Ensure that large clods are broken down prior to application. Do not apply on soils that are subjected to prolonged periods of flooding. Do not apply on soils with less than 2% organic matter. Application on eroded knolls may result in reduced crop stand or rotational crop injury. Granular formulations can be used where trash is heavier or on standing weeds provided that they do not interfere with distribution of the granule on the soil and do not limit incorporation by plugging the incorporation equipment. To avoid concentrating wild oat seeds below the treated layer, do not plow land prior to application of trifluralin. Injury to flax , lentils and wheat may occur if soil and weather conditions are not conductive to rapid crop emergence. To minimize the crop injury, seed into warm, moist seed bed.

Treflan/Advance/Rival/Bonanza – Oilseed, Special Crops (cont'd)

Wheat: Apply only on trash free or summerfallow fields. Wheat must be seeded 5 - 8 cm deep in well tilled seedbed to prevent contact between the chemical and the seed.

Flax, lentils: Shallowly till and pack the soil in spring to ensure a firm seedbed and accurate depth of seeding. Seed into a well-packed, warm moist seedbed. Do not seed deeper than 4 cm.

9. **How it Works:** Kills weed seedlings as they germinate. Inhibits cell division in the actively growing points of root and shoot.
10. **Expected Results: Weeds:** Most weeds die before emerging. Weeds will exhibit swelling in the coleoptile region, stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture obtaining ability.
11. **Effects of Rainfall:** No effect once trifluralin is incorporated into the soil.
12. **Movement in Soil:** None.
13. **Cropping Restrictions:** Normally, trifluralin carryover will not harm crops grown in rotation. As a precaution, oats, sugar beets, creeping red fescue and small-seeded grasses such as timothy and canary seed should not follow trifluralin treated crop. Drought conditions in the year of treatment may result in higher levels of trifluralin carryover into the next year. To avoid wheat injury, seed less than 7 cm deep into a warm, moist seedbed using recommended agronomic practices that will promote rapid, even germination of the crop. Avoid direct seeding (zero till) and seeding into loose seedbeds. Refer to industry or government extension documents that outline the best seeding practice for each crop. As a precaution, do not seed wheat as a rotational crop on land that has received ethalfluralin or trifluralin at oilseed/special crop rate for two consecutive years. Over-application caused by overlapping, improper calibration or non-uniform application may reduce the stand of treated crops or crops grown in rotation.

    Grazing restrictions: Do not graze the treated crop or cut for hay; there are not sufficient data to support such use.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 10,000 mg/kg. In clean water, fish are very sensitive to trifluralin, but in runoff or muddy water, trifluralin binds to soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Granular formulation must be stored in a cool dry location out of sunshine. Do not store Rival EC below 5°C. Do not freeze Treflan EC and Bonanza 400.
17. **Resistance Management:** Advance/Bonanza/Rival/Treflan, is a Group 3 herbicide. Any weed population may contain or develop plants naturally resistant to Advance/Bonanza/Rival/Treflan and other Group 3 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Treflan/Advance/Rival/ Bonanza *(trifluralin)*

Cereals

Group 3

Manufacturers: DowAgroSciences/Nufarm Canada/United Agri Products

1. **Formulations:** Emulsifiable concentrate: **Bonanza 400:** 400 g/L; 10 L; 115 L; 205 L. **Rival EC:** 500 g/L; 9 L; 110 L; 200 L; 900 L containers. **Treflan EC:** 480 g/L; 9.45 L; 115 L containers. Dry Flowable: **Rival DF:** 60%; 7.5 kg bag. Granular: **Advance 10G:** 10%; 22.7 kg bag; 454 kg bulk bag. **Bonanza 10G:** 10%; 22.7 kg; 500 kg bag. **Rival 10G:** 10%; 22.7 kg bag; 567 kg mini bag. **Treflan QR5:** 5%; 25 kg; 725 kg bags.
2. **Registered Mixes:** Advance 10G/Bonanza 10G/Rival 10G/Treflan QR5: None.

   Bonanza 400/Rival EC/Rival DF/Treflan EC: Wheat and barley: Avadex BW; dry bulk fertilizer; Avadex BW + liquid fertilizer (28-0-0). Liquid nitrogen fertilizer.

   Mixing restrictions: Add Bonanza/Rival EC/Rival DF/TreflanEC or Bonanza/Rival EC/Rival DF/Treflan EC + Avadex directly into the liquid fertilizer, mix thoroughly and apply immediately after mixing. Agitate until application is complete.
3. **Crops:**

   Advance 10G/Bonanza 10G/Rival 10G/Treflan QR5: Barley, wheat (special use).

   Bonanza 400/Rival EC/Rival DF/Treflan EC: Barley (8.9), durum wheat (8.6), spring wheat (8.6).

   Underseeding: Not recommended.
4. **Weeds Controlled:**

   Bonanza/Rival EC/Rival DF/Treflan EC: Green foxtail.

   Advance 10G/Bonanza 10G/Rival 10G/Treflan QR5: Barley, wheat (fall): Green foxtail, yellow foxtail. Wheat (summerfallow crop year): Green foxtail, yellow foxtail, lamb's-quarters.
5. **Weeds Suppressed:** Wild oats and wild buckwheat.
6. **When Used:**

   Bonanza 400/Rival EC/Rival DF/Treflan EC: Alone or with Avadex BW in the spring only after seeding and prior to crop emergence.

   Advance 10G/Bonanza 10G/Rival 10G/TreflanQR5: Barley, spring wheat, durum wheat: Fall only, September 1 and soil freeze-up. Wheat summerfallow: May 1 - July 31.

   Warning: Do not apply Advance/Bonanza/Rival/Treflan on land treated with trifluralin products since the previous year.

7. How to Apply:

With: Ground equipment.

Rate:

Liquid or dry flowable formulations		
Product	**Light and medium soil texture**	**Heavy soil texture**
Bonanza 400	570 mL/ac	850 mL/ac
Rival EC	490 - 570 mL/ac	650 mL/ac
Rival DF	400 - 485 g/ac	525 g/ac
Treflan EC	490 mL/ac	690 mL/ac
Granular formulations		
Wheat (summerfallow) only	**All soils (2 - 8% organic matter)**	
Advance10G/Bonanza 10G/Rival 10G	2.23 kg/ac	
Treflan QR5 (fall application only)	4.45 kg/ac	

For use in barley:

	Soil type				
	Light		Medium to heavy		
Product/season	Brown and dark brown 2 - 4 % O.M.	Black 4 - 6% O.M.	Brown and dark brown 2 - 4 % O.M.	Black 4 - 6% O.M.	Black and deep black 6 - 10% O.M.
Advance 10G (fall applied)	3.4 kg/ac	4.4 kg/ac	4.4 kg/ac	5.7 kg/ac	NR
Bonanza 10G (fall applied)	3.4 kg/ac	–	4.5 kg/ac	4.5/kg/ac	5.7 kg/ac
Rival 10G (fall applied)	3.4 kg/ac	–	4.5 kg/ac	4.5/kg/ac	5.7 kg/ac
Treflan QR5	6.7 kg/ac	8.9 kg/ac	8.9 kg/ac	11.7 kg/ac	NR

Water volume: 40 L/ac.

Pressure: 275 kPa.

Nozzles: Flat fan recommended.

Mixing instructions:

Rival DF: Fill sprayer 1/3 full of clean water, then add the recommended amount of Rival 60 DF. Continue the filling operation until required volumes are achieved. Vigorous agitation is required before and during application of Rival 60 DF.

Note: Spray out immediately. Spray mixture should not be left in the tank without agitation.

Incorporation:

Bonanza 400/Rival EC/DF/Treflan EC: Incorporate 2 - 4 cm with 2 cross harrowings with tyne or diamond harrows operated at a minimum of 9 km/h. Both incorporations should be done within 24 hours of application.

Advance 10G/Bonanza 10G/Rival 10G/Treflan QR5: Fall application, incorporate to 8 - 10 cm. The first incorporation within 24 hours and the second delayed for at least 3 - 5 days for more effective weed control. A shallow tillage in the spring, prior to seeding, is required. **Wheat:** Summerfallow application, incorporate to 8 cm. The first incorporation within 24 hours and the second delayed 5 days or until new weed regrowth requires a cultivation or discing. Additional shallow (8 cm) tillage operations may be required to control resistant weed growth.

8. **Application Tips:**

Bonanza 400/Rival EC/DF/Treflan EC: Apply only on trash free or summerfallow fields. Crops must be seeded 5 - 8 cm deep in a well tilled seedbed to prevent contact between the chemical and the seed.

Caution: Crop injury, delayed maturity or reduced yields, may occur if emerging crops are weakened from factors such as improper seeding depth, excessive moisture, cold temperature, seedling disease, poor soil fertility, drought or saline soils.

Advance 10G: Do not apply on soils that are wet, in poor tilth, or contain 15% or more organic matter.

Bonanza 10G/Rival 10G: Do not apply to soils with less than 2% organic matter or more than 10% organic matter. Seeding should be done into a warm, moist seedbed. Avoid seeding in cold soil. In wheat, drought conditions in the fallow year may result in higher than normal carryover of Rival 10G; increase seeding rate of wheat.

Treflan QR5 (special use): Do not apply on soils with less than 2% organic matter or on deep black soils with more than 6% organic matter.

9. **How it Works:** Kills weed seedlings as they germinate. Inhibits cell division in the actively growing points of root and shoot.

10 **Expected Results:**

Green foxtail: Seeds that germinate below the treated layer will produce plants that will emerge. The secondary root system of plants that form within the treated layer is completely inhibited by trifluralin present in that area. The affected plant dies slowly as crop competition and temperature stress over-tax the rootless plant's ability to take up moisture.

Crop: Crop safety is maintained when seeded to a depth of 5 - 8 cm.

11. **Effects of Rainfall:** No effect once incorporated into the soil.
12. **Movement in Soil:** None.
13. **Cropping Restrictions:**

Grazing restrictions: *See Treflan/Advance/Rival/Bonanza (Oilseed, Special Crops).*

Succeeding crops: *See Treflan/Advance/Rival/Bonanza (Oilseed, Special Crops).*

14. **Toxicity:** *See Treflan/Advance/Rival/Bonanza (Oilseed, Special Crops).*
15. **Precautions, First Aid:** *See Treflan/Advance/Rival/Bonanza (Oilseed, Special Crops).*
16. **Storage:** *See Treflan/Advance/Rival/Bonanza (Oilseed, Special Crops).*
17. **Resistance Management:** *See Treflan/Advance/Rival/Bonanza (Oilseed, Special Crops).*

Triumph Plus *(fenoxaprop-p-ethyl + MCPA + thifensulfuron methyl)*

Group 1,4,2

Manufacturer: **Bayer CropScience**

WARNING POISON

1. **Formulations:**
   1. Triumph FM: Emulsifiable concentrate; 56 g/L; fenoxaprop-p-ethyl + 256 g/L MCPA Ester, 13.3 L container.
   2. Plus; Dry flowable; thifensulfuron; 75%, 162 g container.
2. **Registered Mixes:** Lontrel: 85 mL/ac for season-long control of Canada thistle.

3. **Crops:** All spring wheats (except durum). Seedling grasses for forage and seed: creeping red fescue, meadow bromegrass, intermediate wheatgrass, Northern wheat grass, slender wheat grass, smooth bromegrass, tall fescue, tall wheat grass, Western wheatgrass.

4. **Weeds Controlled:**

annual sunflower
burdock
chickweed
cocklebur
corn spurry
cow cockle
field horsetail**
flixweed*
green foxtail
green smartweed
kochia
hemp-nettle
hoary cress**
lady's-thumb
lamb's-quarters
mustards (except dog, green tansy)
plantain**
prickly lettuce
ragweeds
redroot pigweed
Russian pigweed
Russian thistle*
shepherd's-purse
stinkweed
vetch
volunteer rapeseed
wild buckwheat
wild oats
wild radish
yellow foxtail

* Spring seedings only.
** Top growth control only.

5. **Weeds Suppressed:** Canada thistle.

6. **When Used:**

Crop stage: Spring wheat (except durum): Apply when crop has a minimum of 2 leaves and up to a maximum of 6 leaves on the main stem plus 3 tillers. Seedling grasses: 2 - 4 leaf stage.

Weed stage: Annual grassy weeds: Wild oats and foxtail (green and yellow): apply when the weeds are in the 1 - 6 leaf stage of growth. Plants will be controlled up to the emergence of the 3rd tiller.

Broadleaf weeds: Annual sunflower, ball mustard, burdock, cocklebur, field horsetail, flixweed, hoary cress, kochia, mustards, plantain, prickly lettuce, ragweeds, Russian pigweed, shepherd's-purse, vetch and wild radish: apply at 2 - 4 leaf stage. Corn spurry, cow cockle, green smartweed, hemp-nettle, lady's-thumb, lamb's-quarters, redroot pigweed, Russian thistle, stinkweed, volunteer rapeseed and wild mustard: apply when weeds are less than 10 cm tall or across. Chickweed: apply at 1 - 6 leaf stage. Wild buckwheat: apply at 1 - 3 leaf stage. Apply to emerged, young, actively growing weeds. Weeds that emerge after application will not be controlled. Canada thistle: apply when less than 10 cm tall or across.

Note: Treatment at the 3 - 4 leaf stage of crops and weeds usually combines maximum crop tolerance and weed susceptibility. Some broadleaf weeds may not be controlled if infestation is heavy, if weeds are in bud or if weather is dry and cool.

7. **How to Apply:**

With: Ground equipment. Do not apply by aircraft.

Rate:

Triumph FM: 0.67 L/ac.

Plus: 8.1 g/ac.

Water volume: 22.5 - 45 L/ac.

Pressure: Ground: 275 kPa.

Nozzles: Only 110° or 80° stainless steel flat fan nozzles are recommended. Uniform, thorough coverage is important to achieve good control.

Mixing instructions:

1. Ensure the spray tank is thoroughly clean.
2. Fill the tank half full with clean water and start agitation or bypass system.
3. Slowly add the correct amount of Plus (container #1) to the spray tank. Agitate thoroughly until Plus is completely in suspension.
4. Add the correct amount of Triumph FM (container #2) and continue agitation.
5. Triple rinse containers into the spray tank.

6. Add the remaining amount of water while agitation continues. Spray out immediately. Spray mixture should not be left in tank overnight.
7. On repeat loads, prepare a Plus (container #1) slurry in water by slowly adding the correct amount of Plus to 20 litres of water, and add to spray tank. Agitate thoroughly until Plus is completely in suspension. Repeat steps 4, 5 and 6.

Sprayer cleanup:

When moving into wheat, barley, rye or flax: When moving into wheat, barley, spring or fall rye, or flax immediately following the application of Triumph Plus tank mix, clean the sprayer by flushing thoroughly with a water/detergent mixture.

Note: Broadleaf crops can be damaged by Triumph Plus tank mix residues in the spray tank even after a number of applications of a different product. It is critical to thoroughly clean and remove all traces of Triumph Plus tank mix from the spray tank prior to moving into a broadleaf crop.

When moving into broadleaf crops: In all cases, prior to spraying a broadleaf crop (such as canola, peas, lentils, alfalfa, sugar beets, vegetables, etc.), complete a thorough cleaning of the tank because the Plus component of the Triumph Plus tank mix can cause crop injury to sensitive crops at very low concentrations. Follow the cleanup instructions below to ensure adequate sprayer cleaning and removal of the Triumph Plus tank mix.

Cleanup instructions prior to spraying broadleaf crops:

1. Drain and flush tank, boom and hoses with clean water for a minimum of ten minutes. Visually inspect tank to ensure removal of all residues. If necessary, repeat step.
2. Fill tank with clean water while adding 1 litre household ammonia (containing a minimum 3% ammonia) per 100 L of water. Flush solution through boom and hoses, and then add more water to completely fill tank. Allow to sit for 15 minutes with agitation. Again, flush the hoses, boom and nozzles with cleaning solution and drain tank.
3. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
4. Repeat step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

8. **Application Tips:** Do not treat spring wheat underseeded to forages. During periods of stress, plants are not actively growing. When daytime temperatures before or after application are very hot (28°C or 82°F) and/or conditions are very dry and/or there is low humidity, plants are under stress. Application of Triumph Plus tank mix during these periods may result in substantially reduced control. Application of the spray at a forward angle of 45° will result in better penetration of the canopy and better coverage. Do not apply to crop stressed by severe weather conditions, frost, low fertility, drought, water saturated soil, disease or insect damage as crop injury may result.

9. **How it Works:**

Fenoxaprop-p-ethyl: Contact as well as systemic, no soil activity. Regions of high meristematic activity, such as root and shoot tips are known to be affected. MCPA: disrupts cell division and causes abnormal growth responses that affect respiration and food reserves. Thifensulfuron: absorbed by foliage. Inhibits cell elongation.

10. **Expected Results: Grassy weeds:** reduction of leaf growth and chlorotic blotching within 1 - 3 days after application. Initial development of leaf chlorosis within 5 - 8 days after application and complete death within 14 - 21 days after application. **Broadleaf weeds:** growth stops almost immediately. Discolouration of dying weeds may not be noticeable for 1 - 3 weeks after application depending on growing conditions and weed susceptibility. **Poor results may be expected if** improper mixing, timing, coverage or when weeds are under drought stress.

Triumph Plus (cont'd)

11. **Effects of Rainfall:** Do not apply Triumph Plus if rain is expected within 2 hours.
12. **Movement in Soil:** Fenoxaprop-p-ethyl appears to undergo rapid hydrolysis in the soil. MCPA is readily leached from the soil. Thifensulfuron moves little in the soil and has a very short life in the soil.
13. **Cropping Restrictions:** Do not graze treated fields prior to harvest. Pre-harvest interval: 80 days.
14. **Toxicity:** Triumph FM (fenoxaprop-p-ethyl + MCPA Ester): acute oral LD$_{50}$ (rats) = 2,940 mg/kg; Thifensulfuron: low acute mammalian toxicity. Acute oral LD$_{50}$ (rats) = 5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Keep away from fire or open flame or other sources of heat. **Cannot** be stored below freezing. If stored for 1 year or longer, shake well before using. Store the tightly closed containers away from seeds, fertilizer, plants and foodstuffs. Do not use or store in or around the home.
17. **Resistance Management:** Triumph Plus is considered to be a Group 1, Group 2 and Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Triumph Plus and other Group 1, 2 and 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Trophy *(fluroxypyr + MCPA Ester)*

Group 4

Manufacturer: **Nufarm Canada**

1. **Formulations:** Starane: fluroxypyr 180 g/L EC; 4.8 L jug. MCPA Ester 500 g/L EC; 9 L jug.
2. **Registered Mixes:** Achieve Liquid (200 mL/ac) + Turbocharge (spring wheat and barley); Assert (540 mL/ac for wild oats 1 - 3 leaf stage, 670 mL/ac for wild oats at 4 leaf stage) (spring wheat and barley); Horizon (115 mL/ac) + Score adjuvant (spring wheat); Puma^{120} Super (312 mL/ac) (spring wheat and barley).
3. **Crops:** Barley, spring wheat (except durum).
4. **Weeds Controlled:**

   annual sunflower
   cleavers (1 - 4 whorl)
   cocklebur
   common burdock
   common ragweed
   flixweed
   hempnettle (2 - 6 leaf)
   kochia
   lamb's-quarters
   mustard
     (except dog, green tansy)
   prickly lettuce
   redroot pigweed (1 - 4 leaf)
   shepherd's-purse
   stinkweed
   vetch
   volunteer canola
   volunteer flax (1 - 12 cm)
   wild radish
5. **Weeds Suppressed:** Green smartweed, stork's-bill (1 - 8 leaf), wild buckwheat (1 - 4 leaf).
6. **When Used:**

   Crop stage: Barley, spring wheat: 3 leaf to early flag.

   Weed stage: 2 - 4 leaf stage.

7. How to Apply:

With: ground equipment only. With sprayer that can apply 45 L/ac spray solution because lower water volume may cause mixing problems and/or unacceptable crop injury may occur.

Rate:

Starane: 240 mL/ac.

MCPA Ester: 450 mL/ac.

Water volume: 45 L/ac.

Pressure: 135-270 kPa.

Nozzles: Flat fan type. Use 50 mesh or larger screens.

Mixing instructions: Only use in sprayers with good agitation. Ensure sprayer is properly cleaned prior to applying Trophy.

1. Fill the sprayer with 1/2 the required amount of water, start agitation and continue agitation throughout the mixing and spraying procedure.
2. Add required number of jugs of Starane, then MCPA Ester
3. Complete filling the sprayer tank.

8. Application Tips: Trophy activity is influenced by weather conditions. Optimum activity requires active weed growth. Temperature range for optimum activity is 12°C to 24°C. Reduced activity will occur when temperatures are below 8°C or above 27°C. Frost before application (3 days) or shortly after (3 days) may reduce weed control and crop tolerance. Weed control may be reduced during stress conditions, e.g. heat, drought or cold, or if weeds have initiated flowering or if heavy infestations exist. Wet foliage at time of application may result in reduced weed control. Optimum timing of application is 2 - 4 leaf stage of weeds. Application on cleavers can be made up to 6 whorl (20 cm height) stage. Do not apply to wheat and barley underseeded to legumes. Make only one application per year. Application prior to 3 leaf stage of wheat and barley may cause severe twisting of leaves and leaf stem and head deformities, which may reduce yield. Do not apply later than flag leaf stage of crop.

9. How it Works: Trophy herbicide tank mix is non-residual. The components of Trophy tank mix move within the plant to control exposed and underground plant tissue. It mimics naturally occurring plant hormones and controls weeds by disrupting normal plant growth patterns. Symptoms include twisting of stems and swollen nodes.

10. Expected Results:

Broadleaf weeds: Weeds start to twist shortly after spraying. After twisting and bending, plants stop growing, turn brown and die.

11. Effect of Rainfall: Do not apply if rain is expected in 1 hour.

12. Movement in Soil: MCPA and fluroxypyr bind lightly to soil organic matter but do not bind readily to sand, silt or clay. Due to their relatively short half life, they rarely move deeper than 15 cm into the soil.

13. Cropping Restrictions:

Succeeding crops: Fields previously treated with Trophy herbicide tank mix can be seeded the following year to wheat, barley, oats, rye forage grasses, flax, lentils, peas, canola and mustard, or fields can be summerfallowed. Do not seed crops other than those listed above for at least one year following treatment.

Drift: Broadleaf crops are sensitive to spray drift. Minimize drift by using nozzles that put out sufficient spray volume and large droplets.

Grazing restrictions: Allow 7 days between application and grazing.

Other restrictions: Do not harvest the treated mature crop within 60 days after application.

14. Toxicity: MCPA has moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 700 - 880 mg/kg. Fluroxypyr has very low mammalian toxicity. Acute oral LD_{50} = > 2,000 mg/kg.

Trophy (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a dry heated area. If product is frozen, bring to room temperature and agitate before use.
17. **Resistance Management:** Natural populations of certain weeds have developed resistance to some herbicides. To delay the selection of resistant weed populations, rotate the use of herbicides with different modes of action. Trophy herbicide tank mix can be used in a weed resistance management program to delay selection for kochia, chickweed or other susceptible weeds resistant to Group 2 herbicides that inhibit the ALS/AHAS enzyme.

Tropotox Plus/Clovitox Plus/Topside *(MCPB + MCPA)*

Group 4

Manufacturer: Nufarm Canada/Interprovincial Co-operatives Ltd./United Agri Products

CAUTION POISON

1. **Formulations:** Water soluble solution; 375 g/L MCPB + 25 g/L MCPA; 10 L container.
2. **Registered Mixes:** None.
3. **Crops:**

   - alfalfa (seedling, grown for seed)
   - alsike clover (seedlings) (7.2)
   - barley (8.8)
   - clover seedlings
   - fall rye
   - field corn
   - Ladino clover (seedlings)
   - oats
   - pasture
   - peas (7.2)
   - red clover (seedlings)
   - spring wheat (8.9)
   - white Dutch clover (seedlings)
   - wild white clover (seedlings)

   Underseeding: Clover can be used on barley, oats, wheat companion crops.

   Seedling grasses

   - altai fescue
   - altai wild ryegrass
   - creeping red fescue
   - crested wheatgrass
   - green needlegrass
   - intermediate wheatgrass
   - meadow bromegrass
   - meadow fescue
   - northern wheatgrass
   - pubescent wheatgrass
   - red canary grass
   - Russian wild ryegrass
   - slender wheatgrass
   - smooth bromegrass
   - streambank wheatgrass
   - tall fescue
   - tall wheatgrass
   - timothy
   - western wheatgrass
4. **Weeds Controlled:**

   - ball mustard (7.9)
   - bull thistle
   - curled dock
   - lamb's-quarters (8.1)
   - plantains
   - ragweed
   - redroot pigweed (7.4)
   - shepherd's-purse (5.0)
   - stinkweed (7.5)
   - wild mustard (7.9)
   - wormseed mustard (7.9)
   - volunteer rapeseed
5. **Weeds Suppressed:**

   - annual sow-thistle (5.4)
   - Canada thistle
   - creeping buttercup
   - field bindweed (3.2)
   - hemp-nettle (5.9)
   - horsetail
   - perennial sow-thistle
   - tall buttercup
   - wild radish

6. **When Used:**

   Crop stage: Barley, fall rye, oats, spring wheat: 2 leaf to flag leaf stage. Clover: 1 - 4 true leaf stage. Corn: After 45 cm high but before tasseling begins, with drop nozzles. Peas: 3 - 6 expanded leaves or 2 - 5 nodes. (Important: damage may be caused, particularly in early maturing varieties, if spraying is carried out after this stage). Seedling alfalfa: 3 - 6 trifoliate. Seedling grasses: 2 - 4 leaf stage. Pasture: After grazing or cutting.

   Weed stage: Annual weeds: Seedling stage. Bull thistle: Rosette to early bud stage.

   Bindweed, buttercups: in spring, when growth is vigorous. Canada thistle: 15 cm to early bud stage. Curled dock, perennial sow-thistle, plantains: young plants in rosette stage. Horsetail: when 15 cm tall.

7. **How to Apply:**

   With: Ground equipment.

   Rate: 1.1 - 1.7 L/ac depending on weeds to be controlled.

   Seedling grasses: 1.1 - 1.4 L/ac.

   Water volume: 60 - 80 L/ac.

   Pressure: 275 kPa.

   Nozzles: Flat fan recommended.

8. **Application Tips:** Spray in warm weather when plants are actively growing. Peas: Spray when growing conditions are good and the peas are not under stress from drought or disease. Seedling alfalfa: Alfalfa vigour may be reduced in the year of treatment; however, the crop recovers and yield will not be affected.

9. **How it Works:** A systemic, absorbed by leaves and stems and translocated to actively growing regions. It disrupts cell division, stops cell growth and interferes with respiration and food reserves. Selectivity based on ability of plant to efficiently convert MCPB to MCPA.

10. **Expected Results:**

    Broadleaf weeds: Should be dead within 2 - 3 weeks of treatment. **Poor results and/or crop injury may be expected if** water volume is incorrect or weeds are too mature.

11. **Effects of Rainfall:** Rainfall before the foliage has dried from the spraying may decrease activity.

12. **Movement in Soil:** Readily leached from soil. Longer residual in dry soil.

13. **Cropping Restrictions:** Do not graze the treated crop or cut for forage until 30 days after treatment. Do not graze the seedling grasses or cut for hay in the year of establishment.

14. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = 500 mg/kg. Non-toxic to bees. Intake can cause convulsions and coma. Can cause burns to the skin and eyes.

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

16. **Storage:** Store in heated area.

17. **Resistance Management:** Tropotox Plus/Clovitox Plus/Topside is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Tropotox Plus/Clovitox Plus/Topside and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Unity *(bromoxynil + triasulfuron)*

Group 6,2

Manufacturer: **Bayer CropScience**

WARNING POISON

1. **Formulations:** Unity 280EC; Emulsifiable concentrate; 280 g/L bromoxynil, 2 x 4 L jug; Unity 75WG: water dispersible granule; 75% triasulfuron 4 x 43 g.
2. **Registered Mixes:** MCPA Ester (wheat and barley), 2,4-D Ester (wheat and barley), Lontrel (wheat and barley). Puma (durum and spring wheat), Puma^{120} Super (spring wheat).

   Surfactants: Always use a surfactant with this tank mix application. Use a recommended non-ionic surfactant such as Agral 90, Ag-Surf, Citowett Plus, Super Spreader-Sticker, or Companion when applying Unity post-emergent at 0.25% v/v (2.5 L per 1,000 L spray mixture).
3. **Crops:** Barley, durum wheat, spring wheat.
4. **Weeds Controlled:**

   chickweed
   cleavers
   cow cockle
   flixweed
   green smartweed
   hemp-nettle
   kochia
   lady's-thumb
   lamb's-quarters
   redroot pigweed
   shepherd's-purse
   stinkweed
   volunteer canola
   wild buckwheat
   wild mustard
5. **Weeds Suppressed:** None.
6. **When Used:**

   Crop stage: Barley, wheat: 2 leaf stage just prior to flag leaf.

   Weed stage: 2 - 4 leaf stage (2 pairs of true leaves).
7. **How to Apply:**

   With: Ground equipment. **Do not** apply by air.

   Rate: Unity 75WG at 4.3 g/ac plus Unity 280EC at 200 mL/ac.

   Surfactant: 0.25% v/v (2.5 L per 1,000 L of spray mixture).

   Water volume: 40 L/ac.

   Pressure: 275 kPa.

   Nozzles: Flat fan with 50 mesh screens or larger.

   Mixing instructions:

   1. Fill the spray tank one-quarter full with water. Engage gentle jet agitation. On sprayers with by-pass agitation, the agitation should not be engaged until the water soluble bags are completely dissolved. Otherwise, undissolved bags can become lodged on the main screen.
   2. Ensure the agitation system is working properly and that it creates a rippling or rolling action on the water surface.
   3. Add the appropriate number of Unity 75WG water soluble bags directly into the spray tank. **Do not** touch water soluble bags with wet gloves. Allow 6 minutes for complete mixing. Add the required amount of Unity 280EC to the spray tank. Allow a further 2 minutes for complete mixing. Longer mixing time may be required due to cold water or if the water soluble bags are brittle.
   4. Continue agitation while completing the filling of sprayer; then add the recommended surfactant 2.5 L for each 1,000 L of water. Ensure Unity 75WG is completely in suspension before spraying.
   5. Continuous agitation is required to keep Unity 75WG in suspension. **Do not** allow the spray mixture to stand without agitation.
   6. Use the spray suspension as soon as it is prepared.

Sprayer cleanup: To avoid subsequent injury to crops other than cereals, thoroughly clean application equipment immediately after spraying. Ensure that all traces of the product are removed. The following recommendations are provided.

1. Drain and flush the tank, boom and all hoses for several minutes with clean water containing a household detergent. **Do not** clean the sprayer near desirable vegetation, wells or other water sources.
2. Fill the sprayer tank with clean water and add 1 litre of household ammonia (containing 3% ammonia) per 100 L of water. Allow the solution to agitate for 15 minutes prior to flushing through the boom and nozzles and then drain the system.

Caution: Do not use ammonia with chlorine bleach.

3. Remove the nozzles and screens, and wash separately in a bucket containing the ammonia solution.
4. Thoroughly rinse the tank, hoses, booms, nozzles and screens with clean water for 5 minutes to remove all traces of ammonia.
5. Dispose of all rinsings in accordance with provincial regulations.

8. **Application Tips:** Adequate control may not be achieved under unfavorable conditions such as drought, flooding, prolonged temperature extremes or insufficient fertility.
9. **How it Works:** Absorbed through the leaves of emerged weeds and is rapidly translocated to the weed's growing points.
10. **Expected Results: Weeds:** Visual symptoms (discolouration) take 1 - 3 weeks to appear, depending on the weed species and growing conditions. Death of weeds usually takes 3 - 4 weeks after application.
11. **Effects of Rainfall: Do not** apply if rain is expected within 2 hours of spraying.
12. **Movement in Soil:** Degradation of Unity 75WG in the soil is affected by rainfall, soil temperature and soil pH. The breakdown process is more rapid with soil conditions of high moisture, high temperature and low pH.
13. **Cropping Restrictions:**

Grazing restrictions: Do not use treated cereals for grazing of livestock or green feed until 30 days after application. To avoid injury to subsequent crops after an application of recommended rates of Unity, the following recropping intervals should be observed.

Recropping Guidelines for Post-emergent Use

	Minimal interval (months)		
Crop	**Soil pH 6.4 or less**	**Soil pH 6.5 - 7.4**	**Soil pH greater than 7.5**
Barley, durum wheat, oats	10	10	10
Canary seed	22	22	22
Canola	10	22	34
Flax	10	10	22
Lentils, sunflowers, all other crops	Bioassay	Bioassay	Bioassay
Mustard	22	22	34
Peas	10	22	22
Spring wheat (hard red, Canada Prairie extra strong)	No Restrictions	No Restrictions	No Restrictions

14. **Toxicity:** Unity is a package mixture of bromoxynil and triasulfuron. Bromoxynil has moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = 440 mg/kg. Triasulfuron has low acute mamalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.

Unity (cont'd)

15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If inhaled**, remove individual from site of exposure. **If swallowed**, seek medical attention.

16. **Storage:**

    Unity 280EC will solidify at temperatures below -20°C but will become useable again at temperatures above 0°C. **Shake well before using.**

    Unity 75WG: Store above freezing. Prolonged storage at temperatures below 0°C may cause the soluble bag to become brittle.

17. **Resistance Management:** Unity is both a Group 2 and a Group 6 herbicide. Any weed population may contain or develop plants naturally resistant to Unity and other Group 2 and 6 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

UpBeet *(triflusulfuron methyl)*

Group 2

Manufacturer: **DuPont Canada Inc.**

CAUTION POISON

1. **Formulations:** Dry flowable 50%, 117 g container.
2. **Registered Mixes:** Betamix.

    Surfactants: Agral 90, Ag-Surf, Citowett Plus, Sure-Mix.

    Mixing instructions:

    1. Fill the tank 1/4 to 1/3 full with fresh water.
    2. Add the recommended amount of UpBeet to the spray tank with the agitator running. Continue agitation for at least five minutes, until UpBeet is fully dispersed. UpBeet should be thoroughly mixed with water before adding any other material.
    3. As the tank is being filled, add tank mix partners. Add adjuvants last, if needed.
    4. Triple rinse all empty containers at this time and add rinsate to spray tank.
    5. If the mixture is not continually agitated, settling will occur. If settling occurs, thoroughly re-agitate before using.
    6. For repeat tank loads, ensure that the amount of spray solution left in the tank from the previous load is less than 10% of the volume about to be mixed. Fill tank with fresh water as described in step 2 and continue as directed. Emulsifiable concentrates may make dispersion of UpBeet more difficult. For that reason, tank heels of the previous tank mix should be kept to 10% or less of the spray tank volume.

    Note: Continuous agitation is required to keep UpBeet in suspension. To avoid product degradation, apply UpBeet spray mixture within 24 hours of preparation. When using tank mix partners, follow the most restrictive label.

3. **Crops:** Sugar beet.
4. **Weeds Controlled:**

    UpBeet + adjuvant: velvetleaf.

    UpBeet + Betamix: lamb's-quarters, kochia (rosette stage), redroot pigweed, velvetleaf.

5. **Weeds Suppressed:** UpBeet + Betamix: green foxtail.

6. **When Used:**

Crop stage: Sugar beets: apply any time after planting and after weeds have emerged.

Weed stage: Apply when kochia is less than 2.5 cm in diameter and when tank mix with Betamix is preceded by a pre-plant or pre-emergence treatment. If velvetleaf is the predominant weed, 2 applications of UpBeet + adjuvant is preferable to a tank mix of UpBeet and Betamix because of the possibility of antagonism.

7. **How to Apply:**

With: Ground equipment only. Do not apply by air. Do not apply through any type of irrigation equipment.

Rate:

UpBeet: 14 - 28 g/ac plus surfactant 2.5 liters per 1,000 liters of spray solution.

UpBeet + Betamix: 14 - 28 g/ac UpBeet plus 700 - 1,400 mL/ac Betamix (do not use an adjuvant when tank mixing Betamix with UpBeet).

Make two sequential applications. The total grams of product applied must not exceed 40 g/ac per growing season.

Water volume: Minimum of 40 L/ac.

Pressure: 210 - 275 kPa.

Nozzles: Use flat fan nozzles. Use 50 mesh screens or larger.

Sprayer cleanup: It is important that spray equipment is cleaned and free of existing pesticide deposits before using UpBeet herbicide. To avoid subsequent injury to desirable crops, thoroughly remove all traces of UpBeet Herbicide from all mixing and spray equipment immediately after spraying and prior to spraying other crops. Use the following procedure:

1. Drain tank; then flush tank, boom and hoses with clean water for a minimum of ten minutes. Visually inspect tank to ensure removal of all visible residues of UpBeet Herbicide. If necessary, repeat Step 1. **Do not clean sprayer near well or water source or near desirable vegetation.**
2. Fill the tank with clean water, then add 1 litre household ammonia (containing minimum of 3% ammonia) per 100 litres of water. Flush solution through boom and hoses, and then add more water to completely fill tank. Allow to sit for 15 minutes with agitation. Again flush the hoses, boom and nozzles with the cleaning solution and drain tank.
3. Remove the nozzles and screens, and clean separately in a bucket containing cleaning agent and water.
4. Repeat Step 2.
5. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.

Note: Do not use ammonia with chlorine bleach. Using ammonia with chlorine bleach will release a gas with a musty chlorine odor, which may cause eye, nose, throat and lung irritation. Do not clean equipment in an enclosed area. When UpBeet is tank mixed with other pesticides, the most rigorous clean-out procedure should be followed. When UpBeet will be applied over several days, the following method is recommended: at the end of each day, rinse the interior of the tank with fresh water, then partially fill the tank and flush the boom and hoses. This approach will prevent the build-up of dried pesticide deposits, which are difficult to remove from application equipment.

8. **Application Tips:** Applications should be made 5 - 10 days apart or as weeds germinate. Weeds should be actively growing and not under stress. For best results, apply to small, emerged weeds between the cotyledon and 4 true leaf stage at approximately 5 cm tall or across. Applications made to larger weeds or to weeds under stress may result in unsatisfactory control. Since UpBeet has little or no soil activity, only weeds that have emerged above the soil surface will be controlled. Use sequential tank mix applications to control new weed flushes. Timely cultivation(s) can be used in addition to UpBeet tank mixes for optimum weed control in a sugar beet management program. Dry, dusty field conditions may reduce weed control in wheel track areas. Higher water volumes may improve control in these conditions.

UpBeet (cont'd)

9. **How it Works:** Absorbed through foliage. Inhibits cell elongation.
10. **Expected Results:** UpBeet herbicide rapidly stops the growth of susceptible weeds; weeds turn yellow usually 7 - 21 days after post-emergent application, followed by the death of the growing plant. Warm, moist growing conditions before, during and immediately after application promote the activity of UpBeet, while cool and/or dry conditions may reduce or delay herbicidal activity. Large weeds or weeds stressed due to frost, drought or water-saturated soil, disease or insect damage may not be controlled adequately.
11. **Effects of Rainfall:** Rainfall within 6 hours may reduce weed control.
12. **Movement in Soil:** Movement is restricted by finely textured soils, soil organic matter and neutral to acidic conditions. The product is relatively immobile in most agricultural soils.
13. **Cropping Restrictions:** Do not harvest within 60 days of treatment.

    In case of crop failure, only sugar beets may be replanted 30 days after application of UpBeet. However, if a total of 100 g/ha of UpBeet has already been applied to the first crop of sugar beets, then no more UpBeet may be applied to the second crop of sugar beets. Cereal crops (spring wheat, durum wheat, winter wheat, barley) may be planted the following year after application of UpBeet. For all other crops, a field bioassay must be conducted. A successful field bioassay means growing to maturity a test strip of the crop(s) intended for production the following year.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) >5,000 mg/kg.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place, but not below 5°C
17. **Resistance Management:** UpBeet is a Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to UpBeet and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Vanquish *(dicamba)*

Group 4

Manufacturer: **Syngenta Crop Protection Canada Inc.**

WARNING POISON

1. **Formulations:** Liquid; 480 g/L; 10 L jug.
2. **Registered Mixes:** 2,4-D (Amine, LV Ester); 2,4-D + dichlorprop (Desormone LV 700, Diphenoprop BK700, Turboprop 600).

    Roundup and Roundup + 2,4-D: For roadside vegetation control.

    Mixing restrictions: Do not mix with oils. Use aerial tank mixes only on aspen poplar and white birch.
3. **Crops:** Non-crop areas such as established turf, railways, roadsides and utility rights-of-way.

4. Weeds Controlled:

0.50 L/ac Vanquish (turf)

- clover
- erect knotweed
- mouse-eared chickweed
- sheep sorrel

0.95 L/ac Vanquish

- Canada thistle
- common ragweeds
- English daisy
- false ragweeds
- field bindweed
- giant ragweeds
- goldenrod
- perennial sow-thistle
- tansy ragwort

1.90 L/ac Vanquish

- diffuse knapweed
- goat's-beard
- ground cherry
- pasture sage
- poverty weed
- sheep sorrel
- thyme-leaved spurge

3.7 L/ac Vanquish

- baby's breath
- fringed sage brush
- lambkill
- velvet grass

0.85 L/ac Vanquish + 1.8 L/ac 2,4-D Amine 500

- wild carrot

Brush: Rates/1,000 L of water.

Group 1: 2.1 L Vanquish + (4.0 L 2,4-D Amine *or* **3.3 L 2,4-D Ester 600)**

- alder
- aspen poplar
- cherry
- western snowberry
- wild rose
- wolf willow

Group 2: 4.0 L Vanquish + (8.0 L 2,4-D Amine *or* **6.6 L 2,4-D Ester 600)**

- balsam fir
- balsam poplar
- birch
- black cottonwood
- bur oak
- elm
- hickory
- pine
- red oak
- spruce
- tamarack
- vine maple
- white cedar

Group 3: 5.2 L Vanquish + 7.1 L (2,4-D + dichlorprop)

- sugar maple
- white ash

5. Weeds Suppressed: Top growth control.

0.50 L/ac Vanquish

- absinthe
- Canada thistle
- leafy spurge
- perennial sow-thistle
- poverty weed
- scentless chamomile

0.95 L/ac Vanquish

- curled dock

3.7 L/ac Vanquish

- bracken fern
- perennial cinquefoil
- Russian knapweed

6. When Used:

Coniferous and deciduous species: When leaves are fully expanded (spring-early summer), and stop applications at least 3 weeks prior to a change of leaf colour in the fall.

Roadside vegetation control: Vanquish can be used in a tank mix with Roundup for annual vegetation control on 1 - 2 metre wide roadside shoulders. Vanquish tank mixes with Roundup and 2,4-D offer a broader spectrum of total control of roadside vegetation.

Weed stage: Broadleaf weeds: When actively growing, normally between May and July.

7. How to Apply:

With: Aircraft or ground equipment. Thorough coverage essential.

Rate: ***See Weeds Controlled, Weeds Suppressed*****. Rates vary depending on species.**

Roadside vegetation control:

1. 0.5 - 1.06 L/ac Vanquish + 0.3 - 0.4 L/ac Roundup.
2. 0.12 L/ac Vanquish + 0.49 L/ac 2,4-D (500 g/L) + 0.3 - 0.4 L/ac Roundup.

Water volume: Aircraft: 35 L/ac minimum. Ground: Turf weeds: 45 L/ac; Weeds: 45 - 90 L/ac; Brush: rate/1,000 L of water.

Nozzles: Flat fan recommended.

Vanquish (cont'd)

8. **Application Tips:** Thorough coverage of weed and wetting brush to the point of runoff is essential for control. Brush and trees over 2 m should be cut and regrowth sprayed. Do not use on bentgrass. Do not rake, mow or water turf within 24 hours after treatment. 2,4-D Ester tank mix may improve brush control, especially under drought stress. Tank mix with 2,4-D (Amine or Ester) for control of a broader range of weeds. Avoid spraying if temperatures exceed 30°C, to reduce risk of vapour drift. Avoid spraying onto soil over root system of desirable trees and shrubs. Thoroughly clean application equipment after use.
9. **How it Works:** Dicamba is a systemic herbicide absorbed through roots or leaves and translocated in most plants. Disrupts the metabolic and growth activities in the plant.
10. **Expected Results:** Excellent control of brush can be expected within a year of application. Effect on broadleaf weeds may be seen in 10 - 14 days with twisting and bending of main stem, cupping of leaves, increase in root size and increase in fibrous roots.
11. **Effects of Rainfall:** Rainfall 4 hours after application will not reduce effectiveness.
12. **Movement in Soil:** Dicamba is more subject to leaching in sandy soils than in clay textured soils. During the growing season, the half-life of dicamba is less than 30 days.
13. **Cropping Restrictions:** Use on non-crop areas such as roadsides, utility rights-of-way, railways, wasteland and similar areas.

    Grazing restrictions:

    Pastures, rangeland, non-crop area (meat animals): If treated vegetation has been consumed by meat animals within 30 days of Vanquish application, feed the animal with untreated diet for 30 days before slaughter. Meat animals may graze or feed on treated pasture 30 days after Vanquish application without restrictions on slaughter.

    Dairy cattle: (Days = time between treatment and grazing or cutting.) Up to 500 mL/ac – 0 days, 501 - 930 mL/ac – 7 days, 931 mL/ac - 1.86 L/ac – 14 days, 1.87 - 2.87 L/ac – 30 days.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD$_{50}$ (rats) = 3,512 mg/kg. Acute dermal LD$_{50}$ (rats) = >2,000 mg/kg. Low toxicity to fish. Non-toxic to bees. May cause severe damage to eyes.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Freezing may cause crystalization but no activity is lost if completely resuspended.
17. **Resistance Management:** Vanquish is a Group 4 herbicide. Any weed population may contain or develop plants naturally resistant to Vanquish and other Group 4 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

Vantage/Vantage Plus *(glyphosate)*

Group 9

Manufacturer: **Dow AgroSciences Canada Inc.**

CAUTION IRRITANT

1. **Formulations:**

    Vantage: 356 g/L glyphosate acid equivalent (present as isopropylamine salt), 10 L.

    Vantage Plus: 360 g/L glyphosate acid equivalent (present as isopropylamine salt), 10 L, 115 L and 450 L.

2. **Registered Mixes:**

Chemical fallow use only: 2,4-D Amine (or Banvel or Pardner) + non-ionic surfactant.

Minimum tillage: Pardner + non-ionic surfactant, only for application prior to planting barley, oats, wheat.

Glyphosate tolerant canola: Lontrel.

Surfactants: Ag-Surf, Agral 90, Companion, Enhance, Frigate.

3. **Crops:** Prior to planting (all crops), fall stubble treatment, spot treatment (in-crop), non-crop areas, minimum or zero till cropping systems, pasture renovation, summerfallow, preharvest in flax (including linola), wheat, barley, oats, canola, lentils, peas, soybeans, dry beans, forages, glyphosate tolerant canola.

4. **Weeds Controlled:**

Annuals

annual bluegrass (9.0)
annual sow-thistle
Canada fleabane
cleavers
common ragweed
cow cockle
dodder
downy brome
flixweed
giant foxtail
green foxtail
hemp-nettle
kochia
lady's-thumb
lamb's-quarters
large crabgrass
narrow-leaved hawk's-beard
narrow-leaved vetch
night-flowering catchfly
Persian darnel
prickly lettuce
redroot pigweed
Russian thistle
shepherd's-purse
stinkweed
volunteer barley
volunteer canola
volunteer corn
volunteer flax
volunteer mustard
volunteer wheat
wild buckwheat (6.7)
wild mustard
wild oats

Perennials

alfalfa
Canada bluegrass
Canada thistle (7.8)
cattail
common milkweed
cottontop
curled dock
dandelion
field bindweed
foxtail barley
hemp dogbane
hoary cress
Japanese knotweed
Kentucky bluegrass
perennial sow-thistle
poison ivy
purple loosestrife
quackgrass
smooth bromegrass
toadflax
wormwood
yellow nutsedge

Brush

alder
birch
maple
pine
poplar
raspberry
sheeplaurel
snowberry
willow

5. **Weeds Suppressed:** Some weeds suppressed at lower rates.

6. **When Used:**

Annual weeds: Grassy and broadleaf weeds that are actively growing (see annual weed control chart for details). Dodder: spot treatment in sugar beets.

Perennial weeds:

Canada thistle (bud stage): At or beyond bud stage of growth.

Canada thistle (fall rosette): 15 cm in diameter and at least 5 weeks of growth. Majority of them in a rosette stage.

Dandelion: Prior to seeding and post harvest.

Field bindweed: At or beyond full bloom and actively growing.

Milkweed: Bud to full bloom stage of growth.

Note: Reduced results may occur on plants treated after full bloom.

Quackgrass (spring, summerfallow, preharvest, fall stubble): At least 20 cm in height (3 - 4 leaf stage) of growth and actively growing.

Quackgrass (fall tilled ground): Delay application in the spring until majority of quackgrass has 4 - 5 leaves. This stage usually occurs 1 - 4 weeks later on fall tilled ground than on undisturbed ground.

Other perennials: Mostly in head and early bud stage.

Brush: Actively growing brush from June through August.

7. **How to Apply: Do not use galvanized steel or unlined steel tanks as a combustible gas may be formed.**

With: Ground equipment only: boom equipment, handgun, high volume equipment, wipers.

Rate:

Annual Weed Control

Rate	**Growth stage**	**Weeds controlled**	**Comments (apply in 20 - 40 L/ac water)**
0.3 L/ac	Weeds up to 8 cm in height	Green foxtail, lady's-thumb, stinkweed, volunteer barley, volunteer canola, volunteer wheat, wild mustard, wild oats.	For wild oats, apply at 1 - 3 leaf stage. Add 0.14 L of a surfactant registered for use such as Agral 90, Ag-Surf and Companion. For heavy wild oat infestations, use 0.4 L/ac rate.
0.4 L/ac	Weeds 8 cm to 15 cm in height	For annual grasses listed above plus foxtail barley** (suppression only). All other broadleaf weeds listed above plus flixweed** and kochia**.	Add 0.14 L of surfactant registered for use as listed above. Apply before initiation or senescence. ** Suppression only.
0.51 - 0.77 L/ac	Weeds up to 15 cm in height	All annual grasses listed above plus downy brome, giant foxtail, Persian darnel. All annual broadleaf weeds listed above plus Canada fleabane, common ragweed*, flixweed, hemp-nettle, lamb's-quarters, narrow-leaved hawk's-beard***, redroot pigweed, Russian thistle, volunteer flax, wild buckwheat**.	No additional surfactant is required. * **Do not use** these rates on plants greater than 8 cm in height. ** For 3 - 4 leaf stage, use 0.77 L/ac rate. *** For weeds 8 - 15 cm in height, use 0.77 mL/ac rate.
0.91 L/ac	Weeds up to 15 cm in height	All annual grasses listed above, plus annual blue grass, crab grass. All broadleaf weeds listed above plus annual sow-thistle, kochia, narrow-leaved vetch, prickly lettuce, shepherd's-purse.	For additional broadleaf weed control option, refer to tank mix table.
1.42 L/ac	Weeds over 15 cm in height	All annual grasses and broadleaf weeds listed above.	For additional broadleaf weed control option, refer to tank mix table.

Perennial Weed Control

Weed	Growth stage	Application Rate (L/ac)	Water volume (L/ac)	Comments
Alfalfa	Early bud to full bloom stage. Fall application only.	1.5 - 2.0	20 - 120	Allow 5 or more days after treatment before tillage. Use the higher rates when alfalfa populations are high or when heavy grass infestations are also present. For spring applications and control in minimum tillage systems using a 2,4-D tank mix, see section 8.
Canada thistle	Rosette stage (summer fallow)	1.0	20 - 40	Allow 10 or more days after treatment before tillage.
	Bud stage or beyond	1.9 - 2.8	20 - 120	Allow 5 or more days after treatment before tillage.
Common milkweed	Bud to full bloom	4.9	20 - 120	Allow 7 or more days after treatment before tillage. Reduced control may occur after full bloom. Milkweed may not be present in a correct stage, therefore, repeat treatment may be required.
	Bud to full bloom (preharvest)	1.0	20 - 100	
Dandelion	<15cm	1.0	20 - 40	Allow 3 or more days after treatment before tillage for all rates. Use the higher rates when infestations are heavy. Allow 7 or more days after preharvest treatment before tillage.
	>15 cm	1.5 - 2.0	20 - 40	
	Rosette to full bloom (preharvest)	1.0	20 - 40	
Field bindweed	Full bloom or beyond	2.8 - 4.9	20 - 120	Allow 7 or more days after treatment before tillage.
Foxtail barley	Seedling to heading	1.0 - 2.0	20 - 40	Allow a minimum of 1 day after treatment before tillage or seeding. Use higher rate for larger, more established plants, heavy infestations or if plants are stressed.
Quackgrass (control, light to moderate infestations)	3 - 4 green leaves or more	1.0	20 - 120	Allow 3 or more days after treatment before tillage. For higher water volumes (i.e. 60 - 120 L/ac), an approved surfactant must be added at 0.5 L per 100 L of clean water (0.5% v/v).

(continued)

Vantage/Vantage Plus (cont'd)

Perennial Weed Control *(continued)*

Weed	Growth stage	Application Rate (L/ac)	Application Water volume (L/ac)	Comments
Quackgrass *(continued)* (long-term control, heavy infestations, high water volumes)	3 - 4 green leaves or more	1.0 - 2.8	20 - 120	Allow 3 or more days after treatment before tillage. Rates higher than 1 L/ac will provide more consistent long-term control, especially with heavier infestations and/or higher water volumes (i.e. 60 - 120 L/ac).
Toadflax	Vegetative stage (summer fallow) Bud to full bloom (preharvest)	1.0	20 - 40	Allow 7 or more days after treatment before tillage.

Annual Weed Control with Vantage/Vantage Plus Tank Mixtures for Summer Fallow and Minimum Tillage Systems

Tank mixtures	Rate (per ac)	Weeds controlled	Comments (apply in 20 - 40 L/ac water and add 140 mL/ac of surfactant)
Vantage + Banvel II	0.3 - 0.4 L + 0.12 L	Cow cockle, flixweed*, green foxtail, kochia, lady's-thumb, lamb's-quarters, redroot pigweed**, Russian thistle, stinkweed, volunteer canola (rapeseed), volunteer cereals, wild buckwheat**, wild mustard, wild oats.	This tank mixture is registered for **summer fallow use only**. Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm tall. * Vantage is applied at 0.4 L/ac. ** Suppression only. See other tank mixtures for control options.
Vantage + 2,4-D Amine or LV Ester (adjust rates if different formulation is used)	0.3 - 0.4 L + 0.48 L	Flixweed, green foxtail*, kochia, lady's-thumb, lamb's-quarters, redroot pigweed, Russian thistle, stinkweed, volunteer canola (rapeseed), volunteer cereals, wild mustard, wild oats*.	This tank mixture is registered for **summer fallow use only**. Weeds should be less than 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height. * Use Vantage at 0.4 L/ac for wild oats and green foxtail control. ** Suppression only. See other tank mixtures for control options.

(continued)

Annual Weed Control with Vantage/Vantage Plus Tank Mixtures for Summer Fallow and Minimum Tillage Systems *(continued)*

Tank mixtures	Rate (per ac)	Weeds controlled	Comments (apply in 20 - 40 L/ac water and add 140 mL/ac of surfactant)
Vantage + Pardner	0.3 - 0.4 L +0.48 L	Green foxtail, kochia**, lady's-thumb, redroot pigweed**, stinkweed, volunteer canola (rapeseed), volunteer cereals, wild buckwheat*, wild mustard, wild oats*.	This tank mixture is registered for **summer fallow use only** and prior to barley, oats and wheat in minimum tillage systems. Weeds should be at least 15 cm tall and actively growing for best results. Use higher rate if weeds are beyond 8 cm in height. * Use Vantage at 0.4 L/ac rate only for wild buckwheat control. ** 0.4 L suppression only. See other tank mixtures for control options.

Preplant or preseed application in direct seeding systems (all crops): 0.5 - 0.75 L/ac annual weeds up to 15 cm in height. Apply prior to seeding or after seeding, but before crop emergence for control of emerged weeds in direct seeding systems. Ensure weeds are at the desired stage at time of application. This product does not provide pre-emergent weed control, and newly germinating weeds may be a problem in the crop.

Water volume: Handgun, high volume (coarse sprays only): 80 - 120 L/ac. Boom: 20 - 120 L/ac. Chemical fallow, reduced rates: 20 - 40 L/ac. Always use clean water, free of sediments.

Pressure: 275 kPa.

Nozzles: Flat fan nozzles for volumes 20 - 40 L/ac; flood jet type or flat fan for volumes above 40 L/ac.

8. **Application Tips:** Tillage or mowing prior to application will reduce effectiveness on perennial weeds. Minimum (days) to wait before tillage after Vantage applications: annual weeds (1); spring and fall quackgrass (3); Canada thistle bud stage (5), fall rosette stage (7 - 10); field bindweed, milkweed, other perennials (7). Before commencing tillage, allow at least 3 full days (72 hours) after application for quackgrass control and 5 - 7 days after application for thistles if applied other than at early bud stage.

Quackgrass control:

Spring and fall treatments in annual and forage cropping systems: Apply to actively growing quackgrass. Reduced control may result if rhizomes become dormant. This may occur when soil fertility is poor or land has not been tilled for several years.

Application on forages should be followed by tillage 3 days or later and should be made when good growing conditions exist.

Fall treatments should be applied 3 - 4 weeks after swathing to actively growing quackgrass. Quackgrass can be treated after mild frost provided there are 3 - 4 green leaves actively growing at the time of application. Do not apply after first damaging frost in the fall. Frost of -5°C is usually tolerated by new shoots. Frost damage is evident by the drying of new shoots shortly after frost.

Allow 3 or more days after application before tillage.

For best results on fall tilled ground, delay application in the spring until majority of quackgrass has 4 - 5 leaves. This stage usually occurs 1 - 4 weeks later on fall tilled ground than on undisturbed ground.

Vantage/Vantage Plus (cont'd)

Canada thistle (fall rosette): Conduct summerfallow tillage as usual and perform last tillage operation between July 15 and August 1. Allow thistles to regrow for a minimum of 5 weeks until they are 15 cm in diameter and majority of them are in a rosette stage.

Toadflax: To ensure the proper timing, conduct summerfallow tillage as usual and perform the last tillage operation from July 10 to July 21. Allow toadflax to regrow for a minimum of four weeks following last tillage. When the toadflax reach the height of 15 cm and have a large number of green leaves, apply 1.0 L/ac. Wait a minimum of 7 days after application before tilling again.

Note: Canada thistle and toadflax can be treated after a mild frost provided the leaves are still green and actively growing at the time of application. Do not treat after first killing frost.

Alfalfa ploughdown (fall application only): Apply 1.5 L/ac at early bud to full bloom stage. Allow 5 or more days after treatment before tillage. Use the higher rate when alfalfa populations are high or when heavy grass infestations are present.

Alfalfa control with 2,4-D tank mix: For fall control of established stands of alfalfa, apply 1 - 2 L/ac of Vantage + 0.48 - 0.97 L/ac of any 500 g/L of 2,4-D Amine or Ester in 40 - 80 L/ac of water. For spring applications, use only the low rate of 2,4-D and 1 - 2 L/ac of Vantage. Only cereal crops not underseeded to legumes may be planted following spring applications of this tank mix. A 14 day interval between application and planting is required. Use the higher Vantage rates when perennial grasses are prevalent.

9. **How it Works:** A non-selective, systemic herbicide that moves from the foliage into the roots and kills the entire plant.
10. **Expected Results:** Wilting and yellowing of annuals occurs within 2 - 4 days; perennials require 7 - 10 days. Complete browning of above ground growth and deterioration of roots occurs. Cool or cloudy weather may slow activity.
11. **Effects of Rainfall:** Heavy rainfall immediately after application may wash the chemical off the foliage, and a repeat treatment may be required. Do not apply if rainfall is forecast for the time of application.
12. **Movement in Soil:** The amount of glyphosate leaching is very low.
13. **Cropping Restrictions:** All portions of the treated crops may be fed to livestock.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 4,320 mg/kg. Eye irritant. Non-toxic to bees, birds and fish.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Heated storage not required.
17. **Resistance Management:** Vantage/Vantage Plus is a Group 9 herbicide. Any weed population may contain or develop plants naturally resistant to Vantage/Vantage Plus and other Group 9 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42).*

Preharvest – Vantage/Vantage Plus

Application may be made prior to harvest for the control of quackgrass, Canada thistle, common milkweed, toadflax, dandelion, season-long control of perennial sow-thistle and most annual weeds.

Crop: Wheat, barley (including malting barley), canola (rapeseed), dry beans, flax (including low linolenic acid varieties), lentils, oats, peas, forages and soyabean.

Rate:

Vantage/Vantage Plus: 1 L/ac.

Forage crops only: Vantage/Vantage Plus: 1 - 2 L/ac.

With: Ground equipment only.

Crop timing: For annual crops, apply when average seed moisture content is at or below 30%. Accurate measurement of seed moisture content must be made before application. This stage typically occurs 7 - 14 days before harvest. For forage crops, apply at 1 - 2 L/ac 3 - 7 days prior to the last cut before rotation or forage renovation. Consult the table below for visual indicators of this stage in each crop.

Guidelines for Timing of Pre-harvest Applications

Crops	Per cent grain moisture	Visual symptoms
Barley, oats, wheat	Less than 30	Hard dough stage; a thumb impression remains on the seed
Canola	Less than 30	Pods are green to yellow; most seeds are yellow to brown
Dry beans	Less than 30	Stems are green to brown; pods are mature (yellow to brown); 80 - 90% leaf drop (original leaves)
Flax (not including low linolenic acid varieties)	Less than 30	Majority (75 - 80%) of bolls are brown
Forages	Not applicable	Normal stage for forage harvesting
Lentils	Less than 30	Lowermost pods (bottom 15%) are brown and seeds rattle
Peas	Less than 30	Majority 75 - 80% of pods are brown
Soybean	Less than 30	Stems are green to brown; pod tissue is dry and brown in appearance (80 - 90% leaf drop)

Weeds controlled: Canada thistle, common milkweed, dandelion, perennial sow-thistle (season-long), quackgrass, toadflax and most of the annual weeds.

Weed stage: For best weed control results, apply when quackgrass is actively growing and has at least 4 - 5 green leaves. For best results, Canada thistle and perennial sow-thistle should be actively growing and at or beyond the bud stage.

Application tip: This treatment may also provide harvest management benefits by drying down crop and vegetative crop growth and late tillering that may interfere with harvest operations. Apply only during the period 7 - 14 days (or 3 - 7 days for forage applications) before harvest to ensure best weed control and to maximize harvest-aid benefits. Earlier application may reduce crop yield and/or quality and may lead to excess glyphosate residues in the crop. Extremely cool, wet and/or cloudy weather between time of application and the anticipated harvest date may slow down activity of this product, thereby delaying crop dry down and harvest date.

Caution:

Do not apply to any crops if grown for seed.

Consult malt buyers before using preharvest on malt barley.

All portions of the treated crops may be fed to livestock.

Vantage/Vantage Plus (cont'd)

Glyphosate Tolerant Canola (Vantage/Vantage Plus)

Crop: Glyphosate tolerant canola. Always use pedigreed (i.e. certified) glyphosate tolerant canola seed.

Weeds controlled

chickweed
corn spurry
green foxtail
hemp-nettle
kochia
lady's-thumb
lamb's-quarters
redroot pigweed
Russian thistle
stinkweed
volunteer barley
volunteer canola
(non-glyphosate tolerant)
volunteer wheat
wild mustard
wild oats
wild tomato

Weeds controlled at 0.5 L/ac rate

cleavers
cow cockle
night-flowering catchfly
quackgrass (season-long)
shepherd's-purse
smartweed
wild buckwheat

Weeds controlled at 0.5 L/ac rate with sequential applications

Canada thistle (season-long)
perennial sow-thistle (season-long)

Weed suppressed with higher rate: Canada thistle, dandelion, perennial sow-thistle.

Rate: 0.34 - 0.5 L/ac. No additional surfactant is required.

With: Ground equipment only. Do not apply by air.

Water volume: 20 - 40 L/ac.

Crop stage: 0 - 6 leaf stage.

Application tips: The lower rate can be used for the control of shepherd's-purse, cow-cockle and night-flowering catchfly at the 1 - 3 leaf stage or for the control of smartweed at the 4 - 6 leaf stage. A repeat application may improve performance. Ensure crop has not advanced beyond the recommended growth stage. Repeat application may be required if second flush of weeds germinates prior to canopy closure. Some short-term visula yellowing may occur when Vantage/Vantage Plus is applied at the late application (4 - 6 leaf stage). This effect is temporary and will not influence crop growth, maturity or yield. **Maximum 1 L/ac is allowed for post-emergence use**.

Grazing and cropping restrictions: Do not graze the treated crop or cut for hay; sufficient data are not available to support such use.

Velpar L/Velpar DF *(hexazinone)*

Group 5

Manufacturer: **DuPont Canada Inc.**

DANGER CORROSIVE

1. **Formulations:** Water dispersible solution; Velpar L; 240 g/L; 10 L jugs. Water dispersible granule; Velpar DF; 75%, 2.0 kg bag.
2. **Registered Mixes:** None.
3. **Crops:**

Velpar L: Established seed alfalfa for selective weed control. Non-crop areas as an industrial herbicide for total vegetation control. Forestry use for weed and deciduous brush control in coniferous woodland plantations (balsam fir, black spruce, red pine, white spruce). Velpar L used for weed and deciduous brush control in coniferous woodland plantations (balsam fir, black spruce, red pine, white spruce).

Velpar DF: Blueberries, Christmas tree plantations (balsam fir, black spruce, Colorado blue spruce, red pine, scotch pine, white spruce), established seed alfalfa, woodland management areas less than 50 hectars.

4. Weeds Controlled:

Alfalfa: Dandelion, narrow-leaved hawk's-beard, quackgrass, sow-thistle, scentless chamomile.

Non-crop

annual grasses
bedstraw
bladder campion
bromegrass
burdock
Canada thistle
common ragweed
Cypress spurge
dandelion
field bindweed
goldenrod
ground-ivy
hemp-nettle
horsetail
lamb's-quarters
milkweed
mullein
perennial grasses
poison-ivy
purple vetch
spreading dogbane
tansy ragwort
toadflax
vine trumpet
wild carrot
wild grape
wild raspberry

Forestry: Ash, aspen poplar, birch, cherry, maple.

5. Weeds Suppressed: None.

6. When Used: Established seed alfalfa: **Velpar L:** Apply in late fall or early spring when alfalfa is dormant. It must be seed alfalfa established for at least 18 months.

Non-crop (herbaceous weed control):

Velpar L and Velpar DF: Just before or soon after weed emergence. Do not apply to frozen or snow-covered soil or soil with less than 1% soil organic matter.

Forestry:

Conifer site preparation (Velpar L): In spring after ground has thawed.

Undiluted spot treatment for brush (Velpar L): To thawed ground in spring or early summer.

Blueberry: In spring after burning operations but before blueberries emerge.

7. How to Apply:

Established seed alfalfa:

With: Ground equipment.

Rate:

Velpar L: 0.85 - 1.7 L/ac. Applied to dormant, established alfalfa.

Velpar DF: 272 - 544 g/ac.

Blueberry: Velpar DF: 777 gm - 1.04 kg/ac.

Water volume: 81 L/ac.

Pressure: 210 kPa.

Nozzles: Flat fan recommended.

Non-crop and forestry:

With:

Velpar L: Fixed boom sprayer, handgun, back pack sprayers, a watering can for smaller areas or a spot gun.

Velpar DF: By air (forestry only). Fixed or rotary wing, minimum droplet size: 200 micometers UMD (optimum droplet size 400 micometers).

Rate:

Velpar DF: Air: 1.17 - 2.33 kg/ac in 14 L/ac of water. Ground: 1.17 - 2.33 kg/ac in 100 L/ac of water (min).

More than 1 season: 1.8 - 3.6 kg/ac as a foliar spray. Higher rates on clay or clay loam soils and on soils with more than 5% organic matter.

Velpar L/Velpar DF (cont'd)

Velpar L:

Conifer site preparation: 3.6 - 7.2 L/ac. Black or white spruce and jack pine may be planted immediately after the 3.6 L/ac application, but should **not** be planted until a year after application at higher rates.

Undiluted spot treatment for brush: 0.75 - 1.50 mL for each 1 cm of stem diameter (breast height) of plants to be controlled. Direct treatment within 0.5 m of the root collar of plants to be controlled and at least 1.0 m from desirable conifers.

Water volume: Handgun, minimum of 650 L/ac of spray solution. Velpar L: at least 5 L of water for each litre of Velpar L.

8. **Application Tips**: Avoid overlapping spray swaths. **Do not apply to slopes as soil erosion may occur.** Do not apply when vegetation is dormant or semi-dormant as the treatment may not be effective. Do not use on gravelly or rocky soils, exposed subsoil or sandy soils. Since the effect on conifers varies with soil type, uniformity of application and environmental conditions, it is suggested growers first test Velpar L or DF on small areas.
9. **How it Works:** A systemic herbicide readily absorbed through the roots and foliage and translocated upwards. Inhibits photosynthesis.
10. **Expected Results:** Plants become chlorotic soon after treatment and then die. Rainfall will increase efficacy. **Poor results may be expected if** there is inadequate application rate, weed growth too mature, insufficient rainfall or application on areas subject to severe soil erosion.
11. **Effects of Rainfall:** Rainfall less than 4 hours after application may affect the contact activity.
12. **Movement in Soil:** Velpar moves downward in the soil to the root zone of woody species.
13. **Cropping Restrictions:**

    Alfalfa: Do not graze the treated crop or cut for hay; there is insufficient data available to support such use. Do not seed any crop following alfalfa that has been treated with Velpar L until a successful field bioassy shows that the crop in question may be grown safely. A successful field bioassy means growing a test strip of the crop to maturity across the field. Persistence of Velpar L or DF in the soil is influenced by temperature, rainfall, soil type and organic matter. Seeding of field bioassys is not recommended less than 24 months after the last Velpar application.
14. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 1,690 mg/kg. May cause some eye irritation. Slightly toxic to fish. Velpar irritates eyes.
15. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place. Keep away from heat, sparks and open flame.

Venture L *(fluazifop-p-butyl)*

Group 1

Manufacturer: **Syngenta Crop Protection Canada Inc.**

CAUTION POISON

1. **Formulations:** 125 grams/L as the emulsifiable concentrate; 2 x 8 L case.
2. **Registered Mixes: Canola:** Lontrel, Muster (Argentine varieties only), Poast Ultra *, Poast Ultra + Lontrel, Poast Ultra + Muster. **Flax:** Poast Ultra. **Potatoes:** Lexone or Sencor. **Alfalfa, bird's foot trefoil, red clover:** 2,4-DB. **Creeping red fescue:** Ally. **TTC canola only:** Bladex.

   * Add Turbocharge or Merge or a combination of two adjuvants so that the final adjuvant concentration is 0.5 L/100 L spray solution.

   No mixes with fertilizers or insecticides are registered. When tank mixing always check the tank mix partner recommendations for additional restrictions.
3. **Crops:** Alfalfa (8.8), bird's foot trefoil* (7.4) canola (8.6), creeping red fescue* (seedling and established), field peas, flax (8.9) including linola, lentils, mustard, potatoes, red clover*, sunflowers.

   * For seed production only. Do not graze or harvest for feed in year of treatment.
4. **Weeds Controlled:**

   barley (8.4)
   barnyard grass (7.5)
   crabgrass
   fall panicum
   green foxtail (8.4)
   old witchgrass
   Persian darnel (6.8)
   spring wheat (8.4)
   volunteer corn
   volunteer wheat
   wild oats (8.2)
   wild proso millet
   yellow foxtail
5. **Weeds Suppressed:** Quackgrass.
6. **When Used:**

   Weed stage: Apply to actively growing, grassy weeds. Wild oats and volunteer cereals: full 2 - 5 leaf stage*. For optimum control of annual grasses, apply at the 2 - 3 leaf stage. Green and yellow foxtail: full 2 - 4 leaf stage. Quackgrass: 3 - 5 leaf stage, maximum 20 cm tall, not heading.

   * Most effective control of wild oats is achieved when application is made before tillering.
7. **How to Apply:**

   With: Ground equipment only.

   Water volume: 22 - 45 L/ac.

   Pressure: 275 kPa.

   Nozzles: Flat fan type. 50 mesh or larger screens.

   Rate: Maximum use rate 280 g/ac.

Grass weed species controlled	**Rate**
Quackgrass suppression (all crops), green and yellow foxtail	0.57 L/ac
Quackgrass suppression (canola), wild proso millet	0.4 L/ac
Volunteer barley, volunteer wheat, Persian darnel, barnyard grass	0.32 L/ac
Volunteer corn	0.24 L/ac
Wild oats	0.4 L/ac

Add turbocharge adjuvant at a rate of 0.5 L/100 L spray solution (2 L/454 L).

Mixing instructions:

If Muster is to be tank mixed, it must be added to the spray tank before Venture as follows: Add Muster to the spray tank followed by agitation for 2 - 3 minutes. Then add the required amount of Venture and continue agitation for at least 1 minute.

Venture L (cont'd)

8. **Application Tips:** Application made to annual grasses that have tillered and are under moisture and/or temperature stress will not provide acceptable control. Fragmenting of quackgrass rhizomes by tillage in fall or spring prior to seeding will enhance quackgrass control. Crop competition generally enhances control of quackgrass. Do not cultivate for 5 days after application. Less than acceptable weed control may be expected if weeds are under stress because of excessive moisture, drought, or cool weather. Crops offering poor competition to weeds may not provide acceptable control.
9. **How it Works:** Systemic, Venture L is readily translocated from leaf surface to the growing points where it starts killing the grasses. Translocation also carries Venture L to the roots and rhizomes to help prevent regrowth and to add to the control of perennial grasses.
10. **Expected Results:** Grass growth stops in 48 hours. Young shoots turn brown in 7 - 8 days, and complete kill takes place over a 3 - 4 week period.
11. **Effects of Rainfall:** No effect 2 hours after application.
12. **Movement in Soil:** No soil movement. This product will not leach in the soil.
13. **Cropping Restrictions:** Do not harvest red clover, bird's-foot trefoil or creeping red fescue for feed or graze livestock in the year of treatment. Alfalfa (treated crop) and field peas (straw) may be fed to lactating dairy animals and other livestock 41 days (alfalfa) or 66 days (field peas) after treatment.

    Minimum harvest interval to harvest (days): Canola, flax (80), lentils (70), mustard (75), peas (field) (66), alfalfa (41).

    Succeeding crops: Seed only broadleaf crops listed on this label if it is necessary to reseed a crop within 60 days of applying Venture 25DG.
14. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = 4,770 mg/kg. May cause eye and severe skin irritation.
15. **Precautions, First Aid:** When spraying, avoid spray mist by staying upwind from the spray and/or by wearing a suitable mask or respirator. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
16. **Storage:** Store in a cool, dry place. Keep packages dry at all times. Product is not affected by freezing.
17. **Resistance Management:** Venture L is a Group 1 herbicide. Any weed population may contain or develop plants naturally resistant to Venture L and other Group 1 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed *(see page 38 - 42)*.

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Chemical Insect Control in Alberta

The degree of infestation and the severity of insect damage vary drastically from area to area and season to season. Most pests, such as grasshoppers, cutworms and Bertha armyworms, require control during periods of abundance that may last from one to several years. Other pests, like flea beetles, require control annually in some parts of Alberta.

To ensure proper use of insecticides, identify the pest, learn its biology, check your fields and do not panic when you see an insect in your crop. Obtain information on pending pest problems and keep in mind the previous years' problems, so you are prepared for changes in insect population levels.

Chemical control

Attention to the following points should lead to more effective control once a decision to apply an insecticide is made. Insecticides will kill the pest insect if applied properly at a stage when the pest is susceptible. An application made too early or too late in the life cycle may not provide adequate control and would be wasteful. Follow label instructions for proper application. Consider factors like penetration through foliage, weather conditions, age and size of the insect, wait period to grazing or harvest and dosage required when making an application decision. If insects are moving into crops or emerging over an extended period, several applications in the same season may be necessary since most insecticides have limited residual properties when applied to foliage.

Safety

In general, insecticides are more toxic to humans, wildlife, fish, bees and other non-target organisms than herbicides or fungicides. Follow label directions for safety precautions associated with application of each insecticide. Refer to the introductory section of this book for general information on pesticide toxicity, exposure, safety precautions, protective equipment, symptoms, first aid, Poison Control Centres and disposal. Specific information on safety is included with each insecticide.

Bee safety

The insecticides used to protect crops from damaging outbreaks of insect pests can also kill some beneficial insects. The problem facing the applicator is one of how to remove the problem insects from the crop with the least possible impact to beneficial insects such as honeybees, leafcutter bees and other insects. Because bees play such an important role in pollinating some crops, neither beekeepers nor producers want to see them harmed. Although it may not be possible to totally eliminate the impact of insecticides on beneficial insects, their impact can be greatly reduced when agricultural producer, pesticide applicator and the beekeeper work together.

Beekeepers should:

- Talk with the landowners near their bee yards before spray season and provide the producers with their phone number.
- Ask producers if spraying to control insects is likely this year.
- Request the producer to provide them with notification 48 hours in advance of applying an insecticide.

Producers and applicators should:

- Check for potential insect infestations in field crops early and frequently, and determine what the economic thresholds are for problem insects so that a spray program can be planned should it be required.
- Notify beekeepers of intentions to spray 48 hours in advance of spraying.
- Avoid application of insecticides to crops in bloom or to fields containing blooming weeds, which are attractive to foraging bees. Where feasible, use a preventative program early in the season when insecticides may be as effective and crops are not blooming.
- Spray late in the day or early in the morning when the temperature is below ideal foraging temperatures to reduce direct exposure to bees. Honeybees are most active when the temperature is above 18°C (72°F), usually in the heat of the day. As a general rule, evening applications are less hazardous than morning applications.

- Where there is a risk to bees, use an insecticide that has short residual activity to reduce the impact on the bees and to reduce possibilities of residues occurring in honey and pollen.
- Learn about pollination requirements of the different crops grown and about honeybees and leafcutter bees.

Caution

Unusually low temperatures during and immediately following applications cause insecticides to remain toxic to bees for a much longer period than normal. High temperatures will extend the foraging period, and application time must be adjusted accordingly. Prevent insecticides from drifting into adjacent blooming crops, roadsides and pastures with weeds in bloom, water used by bees, leafcutter shelters or apiaries by maintaining a reasonable distance from field boundaries and allowing for the potential movement of insecticides by wind. For more information, contact the Alberta Ag-Info Centre at 1-866-882-7677.

Rights and good practice

By law, persons, provided they do not contravene any land use by-laws, regulations or generally accepted practices, may operate an agricultural operation (including the application of pesticides). It's important to follow label directions and good practices regarding protection of pollinator species from insecticide applications.

Laws generally allow persons to obtain a benefit on their property, provided that the benefit is not achieved at the expense of adjacent landowners. Ensure that pesticides are used in a manner where drift does not occur.

Notification ensures that hazards are identified prior to spraying so that farmers or their custom applicators can adjust application practices to prevent problems, and beekeepers can adjust practices to accommodate spraying. Notification does not mean seeking permission to spray. Producers have the legal right to apply pesticides on their property.

Toxicity of Pesticides to Honeybees

Highly toxic	Moderately toxic	Non-toxic
Severe losses may be expected if the following materials are used when bees are present at treatment time or within a few days thereafter:	These can be used around bees if dosage, timing, and method of application are correct, but do not apply them directly on bees, in the field or at the colonies:	These are relatively non-toxic to honeybees:
Admire	Endosulfan 50W	Benlate T-N-G
APM 50W Instapak	Lannate T-N-G	Bravo 500
Cygon 480	Thiodan 4EC	Captain 80 WDG
Cymbush 250 EC	Thiodan 50WP	Dithane DG
Decis 5EC		Gavel 75 DF
Furadan 480F		Kumulus DF
Guthion Solupak		Manzate 200 DF
Imidan 50 WP		Manzate 200 WP
Lorsban 4E		Penncozeb 75DF
Malathion 25W		Polyram DF
Matador 120EC		Ridomil Gold 480 EC
Pounce		Ridomil Gold MZ
Ripcord 400EC		Ronilan EG
Sevin XLR Plus		Rovral
Sniper		Senator 70WP

Notification is a two-way street – both the beekeeper and farmer have to make efforts to protect pollinators.

Note: In many cases, beekeepers cannot move or cover their bees, especially during honey flow, so timing and accuracy of an insecticide application, plus selection of the safest insecticide where there is risk to bees, are the only ways to safeguard bees.

Livestock and residues

The number of days between the application of an insecticide and harvesting, feeding to livestock or grazing is given on the label. These restrictions must be followed to prevent illegal residues in crops and livestock and to eliminate hazards to consumers.

The guide

This guide only includes the major insecticides registered for use on field crops in Alberta. Not all insects controlled are listed for each insecticide.

Economic threshold

Before making a decision to apply an insecticide, producers need to know if the application would be economically justified. In addition to the expected dollar value of the crop, the producer needs to determine whether the insects present will cause a yield loss greater in value than the cost of control. The economic thresholds listed below will assist in making this decision.

Thresholds are given as the number of insects/unit of measure (such as #/plant or #/m^2) or, for insects that are difficult to sample, the amount of damage evident. Chemical controls are generally only warranted when numbers meet or exceed the threshold level. Remember to sample throughout the field (minimum of 10 samples per 160 acres) to obtain an average infestation level.

Economic Thresholds for Insect Pests of Forage and Special Crops

Insect	Economic threshold	Comments
Alfalfa weevil	Alfalfa hay crops: Apply controls when 25 - 50% of leaves on upper one-third of stem show damage or when 50 - 70% of terminals show injury Alfalfa seed crops: 20 - 25 larvae per 90° sweep or when 35 - 50% of foliage tips show damage	Alfalfa hay crops: 20 - 30 larvae per sweep cause a 12% leaf loss; 50 - 75 larvae per sweep cause a 30% leaf loss; 56 larvae per stem will return treatment costs.
Aphids	Canary grass: 50 per head between heading and soft dough	
Beet leafminer	Sugar beet: Only infestations causing more than 25% defoliation require treatment	
Grasshoppers	Alfalfa: See Cereals and Corn table. Safflower: 15/m	
Pea aphid	Alfalfa: 75 - 100 aphids per plant Field peas: 1 - 4 aphids per 20 cm stem tip when 50 - 75% of plants have begun to flower	
Plant bugs	Alfalfa seed: 5 nymphs per sweep (any or all species of plant bugs) when alfalfa is in bud or bloom	
Red clover thrips	Red clover seed fields: 50 - 80 thrips per raceme	Threshold levels have occurred only during years of early spring drought on dryland.
Sweetclover weevil	Seedling crop (cotyledon stage): 1 weevil per 5 seedlings under slow growing conditions or 1 weevil per 3 seedlings under normal growing conditions Newly emerged 2nd-year sweetclover: 9 - 12 weevils per plant.	

Economic Thresholds for Insect Pests of Cereals and Corn Crops

Insect	Economic threshold	Comments
Aphids		Do not treat for aphids in cereals after the soft dough stage. Aphid populations decrease rapidly as heads mature. **Birdcherry-oat aphid** and **greenbug** vector barley yellow dwarf virus. **Greenbug** injects a toxin that stunts plants.
Birdcherry-oat	Seedling: 20: Boot: 30 (aphids per stem)	
Corn leaf	Seedling: 20: Boot: 30 (aphids per stem)	
English grain	Seedling: 30: Boot: 50 (aphids per stem)	
Greenbug	Seedling: 5 - 15: Boot: 10 - 25 (aphids per stem)	
Russian wheat	**Spring cereals** – Seedling: 10 - 15%; Boot: 15 - 20% (% plants infested) **Winter cereals** – Seedling: 15 - 20% after October 1st	
Armyworm	$11/m^2$	
Barley thrips	Mean of 7.5 thrips per stem based on a sample size of 50 stems, chemical control = $5.75/ac and market value = $1.90/bushel	Infestations of one thrip per stem have caused losses of 0.4 - 1.25 bushels/ac.
Cutworms		8.4 PWC larvae/m^2 caused 25% loss in wheat; 30 PWC larvae/m^2 caused 100% yield loss. **PWC** and **RBC**: well established crops with good moisture can tolerate higher numbers.
Pale western	3 - $4/m^2$	
Red-backed	5 - $6/m^2$ moisture	
European corn borer	Dryland grain corn: when 50% of plants show leaf feeding	
Grain stink bug	Wheat: 1 per head caused losses greater than 30%	
Grasshoppers	$13/m^2$ in fields or $25/m^2$ in roadsides	
Hessian fly	None available	Several larvae per plant may kill barley and wheat.
Orange wheat blossom midge	1 adult seen per every 4 - 5 heads of wheat	Infestations of 30, 60 and 90% reduced spring wheat yields by 40, 65 and 80% respectively in Saskatchewan.
Wheat stem sawfly	None available	Plant resistant varieties if 10 - 15% of the previous crop was cut by sawfly. Infested stems of wheat averaged 17% yield loss.

Economic Thresholds for Insect Pests of Oilseed Crops

Insect	Economic threshold	Comments
Aphids	Canola: rarely a problem Flax: 8 - 10 aphids per stem at green boll stage	Aphids on the top 10 - 15 cm of canola plants near the end of flowering do not cause yield losses.
Army cutworm	Seedling mustard: less than 5/m^2	
Bertha armyworm	20 larvae/m^2 consume 65 kg Argentine canola seed/ha	Economic threshold for Polish canola types is likely 25% less than for Argentine.
Diamondback moth	200 - 300 larvae/m^2 in canola; if leaves are on plants, feeding on pods is limited	Threshold may be lower for Polish than for Argentine type canolas. Timing of the infestation also influences the threshold.
Flea beetles	50% leaf tissue consumed; less if growing and moisture conditions are poor	Damage is usually most severe along field margins and frequently only field margins require treatment.
Lygus bug	Canola: 1.5 and 2.0 lygus bugs per sweep at the end of bloom and early pod development, respectively (crop stage 4.4 and 5.1) Threshold during pod ripening (crop stage 5.2) appears to be greater than 3 per sweep	A threshold for the bud stage has not been determined. Experience in 1998 indicates that heavy adult numbers can cause severe bud blast under dry, hot conditions. At least 10 sets of 15 sweeps, each taken anywhere in a field, are necessary to have an accurate assessment of Lygus numbers. Controls should not be required within 10 days of swathing.
Sunflower beetle	1 adult per 2 - 3 seedlings or over 10 larvae per plant	Severe leaf damage may occur to plants in the 2 - 6 leaf stage when adults are numerous, or at any time when larvae are numerous.
Sunflower maggots	None established	
Sunflower midge	Losses are more severe around field edges; estimate losses by sampling heads and classifying them on the degree of head distortion	
Sunflower seed weevils (grey & red)	Confectionery sunflower: 1 adult per head	(R - 5.1 stage). Re-infestation may occur with a high weevil population. Re-check fields when 80 - 100% of heads are at the R - 5.5 stage.
	Oil sunflower: 10 - 12 seed weevil adults per head	Apply treatment at early anthesis when 30 - 70% of sunflower heads are in early pollen formation.

Insecticide Group Classification by Mode of Action

Mode of action	Chemical family	Active ingredients	Found in
Group 1A, 1B			
Acetylcholinesterase inhibitors. These chemicals inhibit an enzyme, interrupting the transmission of nerve impulses.	Carbamates *(Group 1A)*	carbaryl	ECO Bait, Sevin XLR-Plus
		carbofuran	Furadan
		methomyl	Lannate
	Organophosphates *(Group 1B)*	acephate	Orthene 75%
		azinphos-methyl	Guthion, Sniper
		chlorpyrifos	Lorsban 4E, Nufos 4E, Pyrinex 480 EC Chlorpyrifos 480 EC
		diazinon	Agrox B-2*, Agrox CD*, DCT*
		dimethoate	Clean Crop Lagon, Cygon 4E, Cygon 480, Cygon Hopper Stopper, Dimethoate Plus
		malathion	Fyfanon 50% EC, Malathion
		methamidophos	Monitor
		naled	Dibrom
		phorate	Thimet
		phosmet	Imidan 50-WP Instapak
		terbufos	Counter
		trichlorfon	Dylox
Group 2A			
These chemicals interfer with GABA receptors of insect neurons, leading to repetitive nervous damage.	Chlorinated cyclodienes	endosulfan	Endosulfan, Thiodan, Thionex EC
Group 3			
These chemicals act as a axonic poison by interfering with the nervous system, leading to paralysis.	Synthetic pyrethroids	cyhalothrin-lambda	Matador 120EC
		cypermethrin	Cymbush, Ripcord
		deltamethrin	Decis
		permethrin	Pounce
Group 4			
These chemicals binds to nicotinic acetylcholine receptor, disrupting nerve transmission.	Chloronicotines	clothianidin	Poncho, Prosper*
		imidacloprid	Admire, Gaucho 480*, Gaucho CS FL* Genesis
		thiamethoxam	Helix*, Helix XTra*
Group 8B			
Unknown	Fumigant	aluminum phosphide	Phostoxin

* Contains insecticide and fungicide combination.

Admire *(imidacloprid)*

Group 4

Manufacturer: Bayer CropScience

CAUTION POISON

1. **Formulations:** Flowable; 240 g/L; 1 L; 3.785 L.
2. **Registered Mixes:** None.

   Mixing instructions: To prepare the spray, add a portion of the required amount of water to the spray tank and, with agitation, add Admire Flowable. Complete filling the tank with the balance of water needed. Maintain sufficient agitation during both mixing and application.
3. **Crops:** Potatoes.
4. **Insects Controlled:** Foliar application: Buckhory aphid, Colorado potato beetle, foxglove aphid, green peach aphid, potato aphid, potato flea beetle.

   Soil application: Buckhory aphid, Colorado potato beetle, foxglove aphid, green peach aphid, potato aphid, potato flea beetle, potato leaf hopper.
5. **When Used:**

   Foliar application: A maximum of two foliar applications of Admire may be made per season.

   Soil application: For best results, direct spray on the seed pieces or seed potatoes in the furrow. The higher rate is recommended when extended length of control is needed.

   One, in-furrow soil application of Admire where high Colorado potato beetle populations are expected is allowable; foliar applications of Admire cannot be applied in fields where in-furrow treatment has been used earlier in the same season. Up to a maximum of 2 foliar applications of Admire 240 can be applied where field population monitoring indicates the need and precise timing for treatment.
6. **How to Apply:**

   With: Ground equipment only. Do not apply by air.

   Rate:

   Soil application: 7.5 - 12 mL per 100 meter row or 345 mL to 525 mL per acre based on 90 meter row.

   Foliar application: 80 mL/ac.

   Water volume: Water volume should be adequate to provide sufficient coverage.
7. **Application Tips:** For best results during soil application, direct spray on the seed pieces or seed potatoes in the furrow.
8. **How it Works:** Admire is a systemic chloronicotinyl insecticide.
9. **Grazing, Cropping and Other Restrictions:** Do not apply to within 15 metres of wellheads or aquatic systems, including marshes, ponds, ditches, streams, lakes, etc. Do not apply to terrain where there is a potential for surface runoff to enter aquatic systems. Do not apply when rainfall is forecast for the next 48 hours. Do not mix, load or clean spray equipment within 30 metres of wellheads or aquatic systems. Do not apply this product through any type of irrigation system. **Do not re-enter** treated areas for 24 hours after foliar application of Admire.
10. **Toxicity:** Acute oral toxicity LD_{50} (rats) = 4,143 - 4,870 mg/kg. Dermal toxicity LD_{50} (rabbits) = 200 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes of Equipment* (see page 29) before reuse. Harmful if swallowed or absorbed through skin. Avoid contact with skin, eyes or clothing. Applicators and other handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes and socks. Follow manufacturer's instructions for cleaning/maintaining Personal Protective Equipment (PPE). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove personal protective equipment immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing. **Keep out of reach of children**.

If in eyes, hold eyelids open and flush with plenty of water for 15 minutes. Get medical attention if irritation occurs. **If on skin**, wash thoroughly with soap and water. Get medical attention if irritation occurs. **If swallowed**, contact a Poison Control Centre or a physician. Drink one or two glasses of water and induce vomiting by touching back of throat with finger, or, if available, by administering syrup of ipecac. If syrup of ipecac is available, administer 15 mL (1 tablespoon) of syrup of ipecac followed by 1 to 2 glasses of water. If vomiting does not occur within 20 minutes, repeat the dose once. Do not induce vomiting or give anything by mouth to an unconscious person.

For physician: No specific antidote is available. Treat the patient symptomatically.

12. **Storage:** Store in cool, dry place and in such a manner as to prevent cross contamination with other pesticides, fertilizers, food and feed. Store in original container and out of reach of children.
13. **Resistance Management:** Admire insecticide contains a Group 4 insecticide. Any insect population may contain individuals naturally resistant to Admire and other Group 4 insecticides. The resistant individuals may dominate the insect population if this group of insecticides is used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

Counter *(terbufos)*

Group 1B

Manufacturer: BASF Canada

DANGER POISON

1. **Formulations:** Granular: Counter 5G; 5%; 20 kg bag, 500 kg mini-bulk bag; Counter 15G; 15%; 20 kg lock and load.
2. **Registered Mixes:** 5G may be mixed with fungicide-treated seed.
3. **Crops: 5G:** Canola, mustard. **15G:** Field corn, sugar beets, sweet corn.
4. **Insects Controlled: 5G:** Flea beetles. **15G:** Seedcorn maggot, sugar beet root maggot, wireworms.

   Insect reduction in feeding: 5G: Cabbage root maggots.
5. **When Used:**

   Canola, mustard: At planting.

   Corn, sugar beets: At planting time.
6. **How to Apply:**

   With: Ground equipment. May be applied with airseeders.

   Rate: If extreme infestations of flea beetles are anticipated, use the higher rate.

Crop	Insect	Formulation	kg/ac
Canola, mustard	Flea beetles, root maggots	5G	2.2 - 4.5
Field corn, sweet corn	Northern corn rootworm, seedcorn maggot, Western corn rootworm, wireworms	15G	75 g/100 m row (minimum 75 cm row spacing)
Sugar beet	Sugar beet root maggot, wireworms	15G	45 g/100 m row (minimum 50 cm row spacing)

Counter (cont'd)

Incorporation:

Canola, mustard: Counter 5G and seed may be mixed at seeding time. Use a mechanical mixer or mix in the drill box. Do not handle with bare hands.

Corn: Place in an 18 cm-wide band over the row directly behind the planter shoe in front of the press wheel, or place directly in the seed furrow behind the planter shoe.

Sugar beets: Apply in furrow, 5 - 8 cm behind the seed drop zone after some soil has covered the seed. Do not place 15G granules in direct contact with seed.

7. **Application Tips:** When a seed treatment is also used – mix the seed treatment with seed, then mix granules with treated seed. Empty hoppers of equipment while still in the field. Cover granules that may be exposed on the ends of the treated rows, turns and field loading or cleaning areas.
8. **How it Works:** Counter is a systemic, organophosphorus insecticide with effective initial and residual activity.

Effects of rainfall: The effect of normal rainfall is not appreciable.

Movement in soil: Insoluble in water, therefore, movement is not appreciable.

9. **Grazing, Cropping and Other Restrictions:** Treated sugar beet tops and beet pulp may be fed to livestock after harvest.
10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 1.6 mg/kg. Highly toxic to fish, birds and other wildlife. Rapidly absorbed through skin. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes of Equipment* (see page 29) before reuse. **Keep out of reach of children and animals.** Rapidly absorbed through skin. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning. Counter 15G – pour downwind, allow as little free fall as possible. Do not pour at face level. Sweep up granules and place in a tightly closed, labelled container. Contact BASF Canada to obtain details on how to detoxify product.

If in eyes or on skin, use standard first aid measures. Get medical attention for eyes. **If inhaled**, remove to fresh air. If person is not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. **If swallowed**, seek medical attention immediately.

Symptoms of poisoning: Weakness, headache, tightness of chest, blurred vision, non-reactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea or abdominal cramps. **Call a physician at once in all cases of suspected poisoning**. **In emergency** endangering life or property, call collect day or night, 1-800-454-2673. **Antidote is atropine**. Consult your physician about obtaining a supply of 0.65 milligram tablets for emergency use.

Caution: Seed treated with this product is **extremely** hazardous to livestock. Livestock can be poisoned due to improper storage, improper drill clean-out or improper disposal of treated seed. Never store this insecticide or treated seed in any area accessible to livestock. Clean seed drills away from areas accessible to livestock, and clean up all treated seed spills immediately. Excess treated seed should be disposed of by double planting.

Highly flammable: Fine airborne dust can cause an explosion.

Decontamination: All mixing equipment must be rinsed with the decontamination solution.

Decontamination solution: Wash the surface with the decontamination solution prepared by mixing 9 L of water with 1 L of commercial bleach and 0.5 L of rubbing alcohol. Rinse with clean water. If spills occur on floor areas, use a sweeping compound to clean up. Decontaminate the waste with decontamination solution. Wash floor with decontamination solution and rinse well with clean water. Clean up solution and rinse water with absorbent materials such as sawdust, sweeping compound, rags, etc. Dispose of the contaminated absorbent material in accordance with provincial requirements.

12. **Storage:** Store open bags in labelled, sealed drums or heavy plastic bags.

Cygon 4E/Cygon 480/ Cygon Hopper Stopper/ Clean Crop Lagon/ Dimethoate Plus *(dimethoate)*

Group 1B

Manufacturer: Interprovincial Co-operatives/United Agri Products/Peacock Industries/Cheminova Canada

WARNING POISON

1. **Formulations:** Emulsifiable concentrate; Cygon 4E: 480 g/L; 4 L. Cygon 480: 480 g/L; 10 L. Clean Crop Lagon 480: 480 g/L; 10 L. Dimethoate Plus: 400g/L; 10 L. Hopper Stopper bran bait: 5.2% 20 kg box.
2. **Registered Mixes:** None.
3. **Crops:** See crop/insect controlled and rate chart.
4. **Insects Controlled:** See crop/insect controlled and rate chart.
5. **When Used:** Apply when economic damage is apparent. Repeat if necessary.
6. **How to Apply:**

With: Aircraft or ground equipment.

Rate: Use lower rate for young insects, minor infestations or sparse foliage; higher rate for adult insects (beetles and winged grasshoppers), severe infestations or dense foliage.

Crop	Insect controlled	Rate mL/ac
Clean Crop Lagon 480		
Alfalfa (hay or seed)	Plant bugs	444
Beans	Aphids, bean beetles, leafhoppers, leaf miners, mites	283 - 404
Canary grass	Aphids	202
Flax	Potato aphids	177
Peas	Aphids	111- 172
Potatoes	Aphids, leafhoppers	222 - 444
Safflower	Grasshoppers (nymphs and adults)	222 - 404
Dimethoate Plus		
Alfalfa	Lygus bug, plant bug, potato leaf hopper	344 - 407
	Pea aphids, grasshoppers	212
Beans	Aphids, bean beetles, leaf hoppers, leaf miners, lygus bugs, tarnished plant bug	344 - 505
Cereals	Grasshoppers*	212 - 484
	Say's stink bug	283
Forage crops and pastures	Grasshoppers*	212 - 484
	Sweet clover weevil	484 - 606
Peas	Aphids	142 - 212
Potatoes	Aphids, leaf hoppers	283

* Use higher rate if mature grasshoppers present.

Cygon 4E/Cygon 480/Cygon Hopper Stopper/Clean Crop Lagon/Dimethoate Plus (cont'd)

Crop	Insect controlled	Rate mL/ac
Cygon 4E		
Alfalfa, forage crops, pastures, waste areas	Aphids, leafhoppers, lygus bugs, reduction of alfalfa weevil larvae, young grasshoppers	172
	Adult or winged grasshoppers	344
	Sweet clover weevil	344 - 444
Beans	Aphids, bean beetles, leaf hopper, leaf miner, lygus bugs, mites, tarnished plant bugs	283 - 404
Peas	Aphids	111 - 172
Potatoes	Aphids, leafhopper	222 - 444
Cygon 480		
Alfalfa	Aphids, leafhoppers, lygus bugs, reduction of alfalfa weevil	171
	Blotch leafminers, grasshopper (nymphs)	222
	Grasshopper (adults)	344 - 364
Alfalfa (seed production)	Lygus bugs, plant bugs	444
Alsike clover, red clover, sweet clover	Sweet clover weevil	344 - 444
Barley, oats, wheat	Aphids, thrips	404
	Russian wheat aphids (suppression)	172
Beans	Aphids, bean beetles, leaf hopper, leaf miner, lygus bugs, mites, tarnished plant bugs	283 - 404
Canary grass (seed production)	Aphids	202
Canola	Aphids, grasshoppers, leafhoppers	344 - 364
Flax	Potato aphids	173
Forage crops (grasses, hay, clover, trefoil)	Lygus bugs, plant bugs	172
	Grasshopper (low infestation)	172
	Grasshoppers (nymphs)	222
	Grasshoppers (adults)	344 - 404
Pasture, wasteland	Grasshopper (nymphs)	222
	Grasshopper (adults)	344 - 444
Peas	Aphids	111 - 172
Potatoes	Aphids, leafhopper	222 - 444
Safflower	Grasshoppers	222 - 404
Wheat	Orange blossom midge, say's stinkbug	404
Cygon Hopper Stopper Bran Bait		
Cereals, forages, roadsides, waste areas	Grasshoppers	323 - 449 g/ac

Note: Check product label to ensure the registration for a pest insect is covered by the company.

Water volume: 18 L/ac for good coverage. Potatoes: 80 L/ac minimum; Safflowers: 9 L/ac.

Nozzles: Flat fan recommended.

7. **Application Tips:** Not suitable for application in oil. Do not use when bees are foraging. When using foliar sprays, do not apply during heat of the day or when temperatures are excessively high.

8. **How it Works:** Dimethoate is a broad-spectrum – systemic and contact – organophosphate insecticide and acaricide.

9. **Grazing, Cropping and Other Restrictions:** **Do not treat when bees are foraging.** Do not apply to crops such as alfalfa when in full bloom. Remove cattle prior to spraying.

   Preharvest intervals (days): Alfalfa and forage crops: 171 - 222 mL/ac (2), 344 - 364 (28), beans (7), canary grass (21), canola (21), clover (28), peas (3), potatoes (7), safflower (21), wheat (21).

   Grazing restrictions (days): Beans do not feed or allow livestock to graze treated forage. Alfalfa and forage crops 171 - 222 mL/ac (2), 344 - 364 (28), canola (21), clover (21), pasture waste land (28), peas (21), wheat (7).

   Maximum allowable applications per season: Alfalfa seed (1), canola (repeat only when necessary), flax (1), safflower (2).

10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = 500 - 680 mg/kg, technical = 180 - 336 mg/kg. Highly toxic to birds, bees and other animals. Can be absorbed through the skin. Do not use when bees are foraging.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes of Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Anorexia, nausea, vomiting, pinpoint pupils, excessive salivation, muscle twitching, convulsions or coma.

    Notes to physician: Dimethoate is a cholinesterase inhibitor and an organophosphate insecticide. Atropinize slowly to avoid cardiac arrest. Avoid aspiration and respiratory depressants.

    Decontamination: Spills, scrub contaminated area immediately with a strong laundry soap solution or use household lye – detergents are not satisfactory. Repeated scrubbings are necessary on plain wood surfaces.

12. **Storage:** Store between 5°C and 30°C, away from feed and food.

Decis *(deltamethrin)*

Group 3

Manufacturer: Bayer CropScience

DANGER POISON

1. **Formulations:** Emulsifiable concentrate; Decis 5 EC; 50 g/L; 2.0 L jugs. Flowable; Decis 5 F; 50 g/L; 3 L jugs.

2. **Registered Mixes:** Hoe-Grass II, Hoe-Grass 284, Banvel, Buctril M, 2,4-D, MCPA, Pardner, Stampede, Puma^{120} Super, Puma^{120} Super + Buctril M.

   Mixing restrictions: Do not mix with any other chemicals, additives or fertilizers.

3. **Crops:**

   Decis 5 EC: Alfalfa (for seed production only), barley, canola, fence rows, field corn, flax, lentils, mustard, oats, pastures, potatoes, rangeland, roadsides, sugar beets, sunflowers, wheat (all types).

   Decis 5 F: Barley, canola, flax, lentils, mustard, oats, pastures, rangeland, wheat (all types).

4. Insects Controlled:

Decis 5 EC

alfalfa weevil
Bertha armyworm
cabbage seedpod weevil
clover cutworm
Colorado potato beetle
cutworms
diamondback moth
European corn borer
flea beetles
grasshoppers
leafhoppers
lygus bugs
potato flea beetle
sunflower beetle
tarnished plant bug

Decis 5 F: Only flea beetles and grasshoppers.

5. When Used:

When economic damage is apparent. Grasshoppers: Best results on young (non-flying) grasshoppers (2 - 4 nymphal stage). Sunflower beetle: When crop is in cotyledon to 2 leaf stage. European corn borer: Apply when egg masses begin to hatch. Consult your crop specialists for appropriate spray schedule.

Number of applications: Maximum of 1 per year on Bertha armyworm, cutworms, diamondback moth, potato flea beetle, sunflower beetle. Other pests, maximum of 3 per year. Only 1 aerial application per year except for grasshoppers and potato pests, which can be sprayed twice per year by air.

6. How to Apply:

With: Aircraft: Decis 5 EC and 5 F: Barley, canola, flax, lentils, mustard, oats, pastures, rangeland, wheat. Decis 5 EC only: potatoes, sunflowers. Ground equipment: All crops.

Rate: Use a higher rate for severe infestations, when foliage is dense or when grasshoppers are in the late nymphal or adult stage.

Crop	Insects	Decis 5 EC mL/ac
Alfalfa (seed production only)	Alfalfa weevil, lygus bugs	80 - 100
Barley, flax, oats, pasture, rangeland, sugar beets, wheat	Cutworms	80
	Grasshoppers	40 - 60
Canola, mustard, rapeseed	Bertha armyworm, clover cutworm, diamondback moth, flea beetles	40 - 60
	cabbage seed pod weevil	80
	lygus bug	60
Field corn	European corn borer	100 - 120
Flax	Beet webworm, clover cutworm	40 - 60
Potato	Colorado potato beetle, leafhoppers, potato flea beetle, tarnished plant bug	40 - 60
	Buckthorn aphid, potato aphid	100
Sunflowers	Sunflower beetle	40
Sweet corn	European corn borer, corn earworm	100 - 120

Crop	Insect	Decis 5 F mL/ac
Barley, flax, lentils, oats, pastures rangeland, roadside, wheat	Grasshoppers	32 - 50
Canola, mustard	Flea beetles	40 - 60

Note: Decis 5 EC on high organic (muck) soils: Apply 80 mL/ac. Apply only once during each crop year, prior to August 1.

Water volume: Air: Decis 5 EC and 5 F: 4.4 - 8.8 L/ac. Ground: Decis 5 EC: Alfalfa 40 - 120 L/ac; Field corn 100 L/ac minimum; Potatoes 80 - 200 L/ac. Decis 5 EC and 5 F: Canola, mustard 40 L/ac; Cereals 40 - 80 L/ac.

Pressure: Air: 200 kPa minimum. Ground: 275 kPa.

Nozzles: Aerial droplet size 150 - 250 micron recommended. Flat fan only.

Decis 5 F: 50 mesh or larger line strainers and screens.

7. **Application Tips:**

Air application: Leave 100 m border between edge of treated fields and environmentally sensitive areas (e.g. wetlands, sloughs, rivers, houses, farm buildings). Best control is achieved by morning or evening applications. Do not spray under a strong temperature inversion or when temperature exceeds 25°C. With severe flea beetle and grasshopper infestations, spray fence rows and a 15 m strip into adjacent summerfallow and cropped fields. For grasshoppers use high EC rate only.

8. **How it Works:** Deltamethrin is a non-systemic, synthetic pyrethroid that works by contact and ingestion.

Expected results: Speed of kill depends on target insect and environmental conditions, and death can occur within 2 hours.

Effects of rainfall: Do not apply within 1 hour of rain.

Movement in soil: Becomes fixed on soil colloidal particles and broken down by micro-organisms.

9. **Grazing, Cropping and Other Restrictions: Pre-harvest interval (days):** Alfalfa (20), barley (40), canola (7), flax (40), lentils (30), mustard (7), oats (31), potatoes (3), sunflower (70), wheat (40).

Grazing: Barley, field corn, flax, oats, sweet corn: Do not allow beef cattle to graze treated fields within 1 day of application.

Maximum allowable applications per year: Alfalfa for seed production only (1); field and sweet corn for European corn borer (3); sweet corn for corn earworm and European corn borer (2 – one of which may be by air); barley, flax, oats, wheat for grasshopper (3); strawberries (2).

Warning: Do not allow dairy cattle to graze Decis 5EC treated fields. Do not allow beef or dairy cattle to graze treated fields of sweet corn within 1 day of application.

Feeding: Do not feed treated silage or stubble of field and seed corn to dairy cattle. Do not feed harvested alfalfa forage within 90 days of harvest.

10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) Decis = 395 mg/kg. Severe eye and skin irritant. Very toxic to aquatic organisms and fish. Toxic to bees and other beneficial insects. Do not apply when bees are foraging.

Caution: Studies have shown that synthetic pyrethroid insecticides can be 1,000 - 10,000 times more toxic to fish than many other insecticides in common use. Careless use of these insecticides can seriously harm sport and commercial fisheries. Entry of these insecticides into small wetlands such as prairie sloughs can affect invertebrate life that is needed for waterfowl reproduction and fish farming. Maintain a **minimum** 30 metre buffer for ground application and a **minimum** 100 metre buffer for aerial application. Applications should not be made when wind or rain could favour drift or run-off into lakes, ponds.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes of Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

Symptoms of poisoning: Neurological dysfunction, such as convulsion, with severe poisoning.

12. **Storage:** Do not store below freezing. Do not store near feed or food. Keep away from heat, sparks and open flames.

Dibrom *(naled)*

Group 1B

Manufacture: **United Agri Products**

1. **Formulations:** 864g/L formulated as an emulsifiable concentrate. Container size: 2 x 9.46 L.
2. **Registered Mixes:** This product is compatible with most insecticide and fungicide formulations. Do not use with alkaline materials such as lime or bordeaux.
3. **Crops:** Alfalfa, beans, clover, field areas, pastures, potato, rangeland, sugar beats, vetch.
4. **Insects Controlled:** Aphids, Colorado potato beetles, flea beetles, grasshoppers, leafhoppers, loopers, lygus bugs.
5. **When Used:** Begin application at first sign of insects. Repeat as necessary.
6. **How to Apply:** Apply Dibrom by ground or air. Use designated amounts in full volumes of water.

Ground application: Dilute with water to 100 - 300 L/ha unless otherwise stated.

Aerial application: Unless otherwise stated, dilute with water to 10 - 30 L/ha when aerial application is specified.

Rates:

Crop	Insects	Rate	Application
Alfalfa, clover, vetch	Aphids, leafhoppers, loopers, lygus bugs	445 - 890 mL/ac	Use ground or aerial application.
Beans, peas for processing	Alfalfa looper, aphids, red spider mites	445 - 890 mL/ac	Use ground or aerial application.
Potatoes	Colorado potato beetle, flea beetle, leafhoppers	445 mL/ac	Use ground or aerial application.
Sugar beets	Leafhoppers, red spider mites	890 mL/ac	Do not apply within 5 days of harvest. Use ground application.
Dairies, field areas, pastures, range land	Grasshoppers	Young hoppers: 222 - 344 mL/ac Adult grasshoppers: 283 - 404 mL/ac	Use ground or aerial application.

Note: Grasshoppers – add sufficient water to give a thorough cover and contact spray. Effect of Dibrom may be observed within a few hours. If grasshoppers move in from surrounding areas, repeat treatment as required. Animals may be present during treatment. Use ground or aerial application.

Corrals, adjacent pastures, holding pens (beef and dairy cattle, hogs, horses, sheep): Adult houseflies, mosquitoes – Airplane application – use 110 - 275 mL of Dibrom per hectare (110 - 275 g ai/ha). Dilute 1.5 - 3 L in 100 L water. Apply 9 L diluted spray/ha. Apply over areas with animals present. Repeat as necessary to maintain pest control. To supplement control, treat buildings and protected areas with a space spray, with rotating motion for 2 minutes. Scatter resulting bait on floors, window sills and loading docks in barns, kennels, around garbage cans, refuse areas and other places where flies congregate. Use 90 - 125 g/100 m^2. Repeat as necessary. Bait will remain effective for 2 or 3 weeks. Keep in closed container.

7. **Application Tips:** Thorough coverage required. Do not apply when temperature is over 32°C.
8. **How it Works:** Works through contact action.
9. **Grazing, Cropping and Other Restrictions:** Do not apply to food or forage crops within 4 days of harvest or grazing.

10. **Toxicity:** This product is an organic phosphate insecticide. If symptoms of cholinesterase inhibition appear, atropine sulfate by injection is antidotal. 2-PAM is also antidotal and may be administered, but only in conjunction with atropine.
11. **Precautions, First Aid:** Concentrate may cause skin damage. Do not get on skin, eyes or clothing. Use waterproof gloves and face shield or goggles when handling concentrate. Harmful if swallowed. Avoid breathing spray mist. Avoid contamination of feed, foodstuffs and drinking water. Do not use or store near heat or open flame. May corrode metal spray equipment. Wash equipment thoroughly after use. May be toxic to bees; avoid application during periods of bee activity. If this pest control product is to be used on a commodity that may be exported to the U.S. and you require information on acceptable residue levels in the U.S., contact 1-866-375-4648 or www.cropro.org/. This product contains a petroleum distillate that is moderately to highly toxic to aquatic organisms. Avoid contamination of aquatic systems during application. Do not contaminate these systems through direct application, disposal of waste or cleaning equipment.

    In case of accidental contact, immediately remove clothing and wash thoroughly; for eyes and skin, wash thoroughly and get medical attention or contact a Poison Control Centre. **If swallowed**, immediately call a doctor or contact a Poison Control Centre. If conscious, give a large amount of water to drink and make person vomit. Take container, label or product name and pest control product registration number with you when seeking medical attention. **Keep out of reach of children.**
12. **Storage:** Do not reuse this container for any purpose. This is a recyclable container and is to be disposed of at a container collection site. Contact your local distributor/dealer or municipality for the location of the nearest collection site. Before taking the container to the collection site:
    1. Triple or pressure-rinse the empty container. Add the rinsings to the spray mixture in the tank.
    2. Make the empty, rinsed container unsuitable for further use. If there is no container collection site in your area, dispose of the container in accordance with provincial requirements. For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Contact the manufacturer and the provincial regulatory agency in case of a spill and for cleanup of spills.

Dylox *(trichlorfon)*

Group 1B

Manufacturer: **Bayer CropScience**

DANGER POISON

1. **Formulations:** Solution; 420 g/L; 20 L container; 100 L drum.
2. **Registered Mixes:**

    Mixing instructions: Use immediately after mixing as the product breaks down rapidly in water, especially at pH above 7.
3. **Crops:** Alfalfa, barley, canola, dry beans, field corn, flax, lima beans, oats, popcorn, snap beans, sugar beets, sweet corn, wheat.
4. **Insects Controlled:**

alfalfa caterpillar
alfalfa webworm
beet armyworm
beet webworm
Bertha armyworm
common armyworm
diamondback moth
dipterous leaf miner
imported cabbageworm
lygus bugs
stink bugs
tarnished plant bug
true armyworm
variegated cutworms
western yellow-striped armyworm

Dylox (cont'd)

5. When Used:

Alfalfa: Do not apply to alfalfa 48 hours before or after a period when the temperature drops below 5°C or a frost occurs.

Barley, flax, oats, wheat: Apply prior to flowering or head emergence. Do not apply to flax after flowering. One additional application may be made to barley, oats and wheat after head emergence from leaf sheath. Repeat as necessary.

Dry beans, lima beans, snap beans: Do not apply within 14 days of harvest. Do not apply to lima beans after pod set. Repeat as necessary.

Canola: Do not apply within 21 days of harvest. Repeat as necessary.

Field corn, sweet popcorn: Early application – apply when plants are 8 - 30 cm high.
Late application – up to day of harvest.

Sweet corn: Make 2 foliar applications a week apart in early to mid July. Applications may be made up to day of harvest.

Note: Do not make a total of more than 3 applications per season to any one crop of corn.

Sugar beets: Do not apply within 14 days of harvest. Repeat as necessary.

6. How to Apply:

With: Aircraft or ground equipment.

Rate: Low rate for immature insects, light infestations or sparse foliage.

Exception: Webworm control on sugar beets – use higher rate with low volume air application, low rate with row crop sprayers.

Crop	Insects	L/ac
Alfalfa	Alfalfa caterpillar	0.4 - 0.6
	Alfalfa webworm	0.28 - 1.1
	Beet armyworm, varigated cutworm	0.6 - 1.1
	Lygus bugs, stink bugs, tarnished plant bug	1.1
Barley, flax, oats, wheat	Common armyworm, true armyworm, western yellow-striped armyworm	0.6
	Beet webworm, varigated cutworm	0.6 - 1.1
	Bertha armyworm	1.1
Beans	Armyworms, dipterous leaf miner, imported cabbageworm, lygus bugs, stink bug	1.1 - 1.6
Canola	Beet webworm	0.6
	Diamondback moth	1.1
	Lygus bugs	0.55
Field corn, sweet corn	Armyworms, cutworms	0.6 - 1.1
Sugar beets	Beet webworm	0.3 - 0.6
	Dipterous leaf miners, varigated cutworm	0.28 - 0.6
	Alfalfa webworm, beet armyworm	1.1 - 1.6

7. Application Tips: Trichlorfon is a selective insecticide: beneficial insect species are less affected. This selective advantage is lost when product is used in conjunction with or alternated with non-selective pesticides.

Corn: For early applications to control armyworms and cutworms, spray when plants are 8 - 30 cm high, and direct the spray to the lower portions of the plant. Later applications may be made as full coverage. Do not apply to or allow spray drift onto varieties of sorghum that are sensitive to phosphates.

8. How it Works: Trichlorfon is an organophosphate insecticide that works by contact and ingestion.

9. **Grazing, Cropping and Other Restrictions:** Pre-harvest or pre-grazing interval (days): Alfalfa (14); barley, flax, oats, wheat (21); beans (14); canola (21); corn (0); sugar beets (14). Re-entry interval: Do not enter treated areas until 24 hours after application.

   Sugar beets: Do not feed tops harvested within 28 days of treatment. Do not re-enter treated areas for 24 hours after applicaiton.

10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 144 mg/kg, 80% Powder = 470 mg/kg, Liquid solution = 950 mg/kg. Can cause eye damage and be absorbed through the skin. Intake can cause respiratory failure. Do not apply when bees are actively foraging.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Tightness in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea.

    For physician: Antidote is atropine sulphate administered in large therapeutic doses, repeated as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine. Do **not** give morphine.

12. **Storage:** Store above 0°C and away from excessive heat and open flame. Store in an area specially designated for pesticides. Do not store near any material intended for use or consumption by humans or animals.

ECO Bait *(carbaryl)*

Group 1A

Manufacturer: **Peacock Industries Inc.**

1. **Formulations:** 2% carbaryl ; 20 kg bag.
2. **Registered Mixes:** None.
3. **Crops:** Cereal crops, forages, pasture, roadsides, waste areas.
4. **Insects Controlled:** Grasshoppers.
5. **When Used:** Apply when pest emergence is at its peak and grasshopper populations are above the economic threshold. Repeat application only as necessary, but not more frequently than once a week during periods of heavy infestation and once every two weeks during moderate to low infestation
6. **How to Apply:**

   With: Ground equipment only. **Do not apply by air**.

   Rate: 0.8 - 1.6 kg/ac. Note: The higher rate should be used for older grasshoppers or severe infestation
7. **Application Tips:** Timing and good coverage are essential for effective control. Do not apply within 50 meters of sloughs, ponds, streams, dugouts or open water. Apply when winds are between 3 - 8 kph and do not favor drift.

ECO Bait (cont'd)

8. **How it Works:** A carbamate insecticide that works by contact and ingestion. Moderate to rapid in speed of action with moderate to long residual effectiveness (2 days to 4 weeks) depending on crop/pest complex, formulation and climatic conditions.

   Effects of rainfall: Do not apply just before rain.

   Movement in soil: None.

9. **Grazing, Cropping and Other Restrictions:** Pre-harvest or pre-grazing interval (days): Barley, sweet white lupin (28); canola (treat only seedling); beans (5); oats, rye, wheat (14); field corn, sweet (1); alfalfa, clovers (2), forage crops (2); field borders, headlands, rights-of-way; roadsides, wasteland (0). Livestock re-entry period to pasture or rangeland (days): Beef cattle or other livestock (1), dairy cattle (2).

10. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD50 (rats) = 540 mg/kg. Although carbaryl is toxic to honey bees, presence of ECO Bait on flowering crops such as alfalfa and clover will not harm foraging honey or leafcutter bees.

11. **Precautions, First Aid:** Can be absorbed through the skin. Ensure the residue on the plants is dry before foraging begins. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Salivation, tearing, urination, defecation, pinpoint pupils, muscle spasms, general muscular weakness, nausea, prostration, convulsions.

    For physician: Carbaryl insecticide is a moderate, reversible cholinesterase inhibitor. **Atropine is antidotal**. Do not use 2-PAM opiates or cholinesterase inhibiting drugs.

12. **Storage:** Store away from food and feed.

13. **Resistance Management:** Carbaryl is a Group 1A insecticide. Any insect population may contain individuals naturally resistant to carbaryl and other Group 1A insecticides. The resistant individuals can dominate the insect population if these insecticides are used repeatedly. These resistant insects will not be controlled by carbaryl or other insecticides.

Furadan *(carbofuran)*

Group 1A

Manufacturer: **Bayer CropScience**

DANGER POISON

1. **Formulations:** Flowable; Furadan 480; 480 g/L; 4 x 4 L pack.
2. **Registered Mixes:** Furadan 480: all formulations of 2,4-D and MCPA (use only on crops listed on both labels). Compatible with most fungicides. Do not mix with Bordeaux mixture or hydrated lime.
3. **Crops:**

   canola
   field corn
   mustard
   potatoes
   silage corn
   sugar beets
   sweet corn

4. **Insects Controlled:**

   aphids
   Colorado potato beetle
   European corn borer
   flea beetles
   leafhoppers
   potato flea beetle
   potato leafhopper
   sugar beet root maggot
   tarnished plant bug

5. **When Used:**

Aphids, Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug: Apply as soon as insects reach threshold level.

European corn borer: No later than when first feeding is seen on foliage. Follow provincial recommendations based on the moth flight monitoring program. For second brood borers in late planting, apply before tassels show.

Flea beetles: Apply about 2 weeks after seeding or when insects are noticeable.

Sugar beet root maggots: Apply at the very early stage of root maggot activity, usually the first week in June. Application must be followed with light sprinkle irrigation to incorporate Furadan.

Sunflower beetle: Apply when these insects are first noticeable. Do not apply after plants are more than 60 cm in height or after heads have started to form.

6. **How to Apply:**

With: Aircraft (excluding potatoes) or ground equipment.

Rate:

Crop	Insects	mL/ac
Canola, mustard	Flea beetles	60
	Red turnip beetle	111
Field corn, silage corn, sweet corn	European corn borer	445
Potatoes	Potato flea beetle, potato leafhopper, tarnished plant bug	445
	Colorado potato beetle	225
Sugar beets	Sugar beet root maggot	950
Sunflower	Sunflower beetle	111

Water volume: Air: 8 L/ac minimum. Ground: 40 L/ac minimum. Potatoes: 325 - 405 L/ac. Use sufficient water for thorough coverage.

Sugar beets: 80 L/ac as a drench over the row followed by a light sprinkler irrigation to incorporate Furadan into the soil.

Pressure: Potatoes: 275 kPa minimum.

Nozzles: Flat fan recommended.

7. **Application Tips:** Check fields shortly after emergence. Boom sprayers: equip with hydraulic or mechanical agitation and 50 mesh screens; remove any felt filters.

8. **How it Works:** Carbofuran is a broad-spectrum, carbamate insecticide, acaricide and nematicide.

9. **Grazing, Cropping and Other Restrictions: Pre-harvest interval or pre-grazing interval (days):** Canola (60); corn (7); mustard (21), potatoes (7); sunflower (60).

Pre-grazing interval: Corn (3).

Maximum allowable application per season: Corn, potatoes, sunflower (2).

Sugar beet tops and pulp may be fed to beef and dairy cattle without causing residues in meat or milk.

10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 11 mg/kg. Flowable 480 = 38 mg/kg. Highly toxic to bees, waterfowl, birds, fish and other wildlife.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

Furadan (cont'd)

Symptoms of poisoning: Blurred vision, nausea, excessive perspiration, weakness, headache, light-headedness, constriction of pupils, cramps, salivation and vomiting. Carbofuran causes reversible cholinesterase inhibition.

Notes to physician: It is a cholinesterase inhibitor. Atropinize slowly to avoid cardiac arrest. Don't use oximes (e.g. 2-PAM).

Special precautions for burrowing owl: The use of Furadan may pose a hazard to the burrowing owl, a threatened species. The burrowing owl is known to nest in abandoned ground squirrel and badger burrows in specific areas of the southern Prairies. These burrows are commonly found in non-cultivated land such as roadsides, ditchbanks, pastures and rangeland. Areas heavily grazed by livestock and where ground squirrels (gophers) abound are favorite nesting habitats of the burrowing owl. Prior to applying Furadan 480F, the user must determine whether burrowing owls are in or around the area to be treated and must not apply Furadan 480F within 250 meters of burrowing owl nests. Information in identification, range and habits of the burrowing owl can be obtained by calling: Fish and Wildlife Division, Red Deer (403-340-5142) or Lethbridge (403-381-5281).

12. **Storage:** Do not store below 2°C.

Gaucho 480/Gaucho CS FL

(imidacloprid + carbathiin + thiram)

Insecticide – Fungicide

Group 4 *(Insecticide)* **Group 7,M** *(Fungicide)*

Manufacturer: Gustafson Partnership

CAUTION POISON

1. **Formulations:** Gaucho 480: Flowable containing imidacloprid 480 g/L; Gaucho CS FL: Flowable containing imidacloprid (285.7 g/L) + carbathiin (47.6 g/L) + thiram 95.3 g/L.
2. **Registered Mixes:** Gaucho 480 is only available to commercial treaters. The following two systems are available for treated canola, mustard and rapeseed:

   Gaucho Canola System which is a combination of Vitavax rs Fungicide, metalaxyl and Gaucho 480 at the low rate applied to the seed or Gaucho CS at 1,400 mL plus metalxyl. **Gaucho Platinum** is a combination of Vitavax rs Fungicide, metalxyl and Gaucho 480 at the high rate applied to the seed or Gaucho CS at 1,400 mL plus metalxyl and Gaucho 480 at 833 mL.
3. **Crops:** Canola, mustard, rapeseed.
4. **Insects Controlled:** Flea beetle. The fungicides in the two other products in the Gaucho Canola System and Gaucho Platinum will protect against seed-borne blackleg, seed rot and seedling blight caused by Alternaria, Pythium and Rhizoctonia. Gaucho at the high rate (Gaucho Platinum) is also approved for control of aphids, suppression of exit hole damage to pods from seed pod weevil lavrae and the suppression of second generation of lygus.
5. **When Used:** Available to custom seed applicators only. Rate of Gaucho 480 is 833 - 1,667 mL per 100 kg of seed. Rate of Gaucho CS is 1,400 mL per 100 kg of seed. Treated seed should be tested for germination if stored for more than 9 months.
6. **How to Apply:** Must be applied with a suitable colourant. Can be applied with the Magna Coat Coating. Gaucho CS is a ready-to-use product with colourant.
7. **Application Tips:** Applicators should consult with Gustafson regarding application procedures for the different products.

8. **How it Works:** Imidacloprid is a systemic insecticide, and it is absorbed into the germinating seed and seedling to protect the plant from feeding. Some damage will occur as the flea beetle must ingest the plant for mortality to occur. Imidacloprid has direct toxic effects and anti-feeding effects on flea beetles. The higher rate will extend the level of protection.
9. **Grazing, Cropping and Other Restrictions:** Do not graze or feed livestock for 4 weeks after planting.
10. **Toxicity:** Moderate acute toxicity. Acute LD_{50} (rats) = 400 mg/kg. Safe to bees foraging on plants when applied as a seed treatment.
11. **Precautions, First Aid: Do not** reuse container for any purpose. **Keep out of reach of children**. Work in a well ventilated area when treating seed or while augering or handling treated seed. Augers used for handling treated seed should not be used to move seed or for feed, food or oil processing. Do not reuse bags from treated seed to handle food or feed products. Do not contaminate feed or foodstuffs with treated seed. Treated seed must be labelled as follows: **"This seed has been treated with Gaucho – contains imidacloprid, do not use for food, feed or oil processing."** Wear chemical resistant gloves when handling treated seed.

    If in eyes, wash immediately with running water for 15 minutes. Contact a Poison Control Centre or a physician. **If on skin**, wash with warm water and soap. Get medical attention if irritation persists. If signs of intoxication (poisoning) occur, get medical attention immediately. **If inhaled**, remove victim to fresh air or uncontaminated area. If not breathing, give artificial respiration. Get medical attention as soon as possible. **If swallowed**, induce vomiting by giving the patient ipecac (adult or child 12 years or older, 30 mL; child under 12, 15 mL), followed by water to enhance vomiting. If vomiting is not induced, repeat the dosage once. Keep patient quiet and contact a Poison Control Centre or a physician, bringing the labelled container with you. Do not give anything by month or attempt to induce vomiting if the person is unconscious.
12. **Storage:** Store product in original container only, away from other pesticides, fertilizer, food or feed. Do not store Gaucho 480 Fl in direct sunlight. Do not store Gaucho 480 Fl above 35°C or below 10°C.
13. **Resistance Management:** Gaucho CS FL seed treatment contains a Group 4 insecticide and Group 7 and M fungicides. Any insect or fungal population may contain individuals naturally resistant to Gaucho CS FL seed treatment and other Group 4 insecticides or Group 7 or M fungicides. Other resistance mechanisms that are not linked to the site of action but are specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed. A gradual or total loss of pest control may occur over time if these insecticides/fungicides are used repeatedly in the same fields.

Genesis *(imidacloprid)*

Group 4

Manufacturer: Gustafson

CAUTION POISON

1. **Formulation:** Flowable; imidacloprid 240 g/L, 3.8 L.
2. **Registered Mixes:** Apply sequentially before fungicide dusts application.
3. **Crops:** Potatoes.
4. **Insects Controlled:** Control of aphids, Colorado potato beetle, flea beetle, potato leaf hopper.
5. **When Used:** Seed treatment. Apply just prior to seeding. Can be applied when potato pieces are being cut.
6. **How to Apply:** Apply specified dosage as a diluted spray onto seed-pieces using a shielded spray system that is well contained and will prevent the loss of any liquid. Do not dilute with any more than 3 parts water to 1 part GENESIS 240 Insecticide. Agitate or stir spray solution as needed. For optimal insect control, good coverage of the seed piece is required.

7. **Application Tips:** As part of the seed cutting and treating process, application of a fungicide registered for potato seed treatment or an inert absorbent ingredient is recommended right after applying liquid Genesis.
8. **How it Works:** Imidacloprid is a systemic chloronicotinyl insecticide
9. **Grazing, Cropping and Other Restrictions:** Treated areas may be replanted with any crop specified on an imidacloprid label, or any crop for which a tolerance exists for the active ingredient, as soon as is practical. Rotation of fields treated with GENESIS 240 Insecticide to cereal grains (wheat, barley, oats) is acceptable after a minimum plant-back interval of 30 days and to peas and beans (including fababeans, soybeans, adzuki beans, mung beans, lima beans, scarlet runners, dry common beans, snap common beans) is acceptable after a minimum plant-back interval of 9 months. Rotation to all other food and feed crops will require a 12 month plant-back interval be observed. Green manure and other cover crops not intended for human or animal consumption are acceptable rotational crops that do not require a plant-back interval following treatment. Do not graze or harvest such cover crops for food or feed. It is not recommended that this product be used in fields treated with GENESIS 240 Insecticide or ADMIRE 240 F Insecticide during the previous season. This product is toxic to wildlife. Keep out of lakes, streams, ponds or other aquatic systems. Do not contaminate water when disposing of equipment wash waters. Apply this product only in accordance with the label directions. Dispose of all excess and any spilled treated seed pieces by covering or incorporating into the soil. Leftover treated seed should be double sown around the headland or buried away from water sources such as lakes, streams, ponds or other aquatic systems.
10. **Toxicity:** Acute oral toxicity LD$_{50}$ (rats) = 4, 143 - 4,870 mg/kg. Dermal toxicity of (rabbits) = 200 mg/kg.
11. **Precautions, First Aid:** Harmful if swallowed or absorbed through skin. Avoid contact with skin, eyes, or clothing. **Keep out of reach of children.**

    Applicators and other handlers must wear: Long-sleeved shirt and long pants, water-proof gloves and shoes plus socks. Follow manufacturer's instructions for cleaning/maintaining personal protective equipment (PPE). If there are no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry. Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then, wash thoroughly and put on clean clothing. Remove personal protective equipment immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing. Apply only in areas with adequate ventilation or in areas that are equipped to remove spray mist. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. Handlers of treated seed must wear personal protective equipment listed above.

    If in eyes, hold eyelids open and flush with plenty of water for 15 minutes. Get medical attention immediately if irritation occurs. **If on skin**, wash thoroughly with soap and water. Get medical attention immediately if irritation occurs. **If swallowed**, Contact a Poison Control Centre or a physician immediately. Drink one or two glasses of water and induce vomiting by touching back of throat with finger or, if available, by administering syrup of ipecac. If syrup of ipecac is available, administer 15 mL (1 tablespoon) of syrup of ipecac followed by 1 to 2 glasses of water. If vomiting does not occur within 20 minutes, repeat the dose once. Do not induce vomiting or give anything by mouth to an unconscious person. Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.

    Toxicological information: No specific antidote is available. Treat the patient symptomatically.
12. **Storage:** Store in cool, dry place and in such a manner as to prevent cross contamination with other pesticides, fertilizers, food and feed. Store in original container and out of reach of children.

Guthion/Sniper *(azinphos methyl)*

Group 1B

Manufacturer: Bayer CropScience/United Agri Products

DANGER POISON

1. **Formulations:** Spray concentrate (SC); 240 g/L; 20 L pail; water soluble bag – 500 gm; 2 kg bag (50W).
2. **Registered Mixes:** None.

   Mixing instructions: Wettable powder: mix the required amount with a small quantity of water. Add this pre-mix through the screen while filling the sprayer tank, or fill the tank to the required level and then add the pre-mix. Operate the agitator while mixing. Depending on the water temperature and the degree of agitation, the packets should be completely dissolved within 5 - 10 minutes from the time they were added to the water.

   Rate: Pour the required amount into full amount of water and then agitate.
3. **Crops:** Alfalfa, clover, potatoes, rye.
4. **Insects Controlled:**

   alfalfa plant bug
   alfalfa weevil
   Colorado potato beetle
   diamondback moth
   flea beetles
   grasshoppers
   leafhoppers
   lygus bugs
   red turnip beetle
   spittle bug
   sweet clover weevil
   tarnished plant bug
5. **When Used:** Maximum number of applications: one per season on rye. One per season on alfalfa and clover, except 2 per season for sweet clover weevil control or when using rates of 910 mL SC/ac or less. Repeat as necessary on potatoes to a maximum of 3 applications per season.
6. **How to Apply:**

   With: Ground equipment. May be applied by air only on alfalfa, clover and rye.

   Rate: Lower rate on immature insects, light infestations or sparse foliage.

Crop	Insect	Liquid mL/ac	Powder g/ac
Alfalfa, clover	Alfalfa plant bug, alfalfa weevil, clover leaf weevil, flea hopper, leafhopper, lesser clover leaf weevil, lygus bug, spittlebug	900 - 1400	450 - 700
	Grasshoppers	440 - 700	212 - 344
	Sweet clover weevil	900	450
Potato	Colorado potato beetle	700	344
	European corn borer, flea beetle, leafhoppers, spittlebug, tarnished plant bug	900 - 1400	445 - 710
Rye	Cereal leaf beetle	440 - 700	344 - 453
	Grasshoppers	700 - 900	212 - 344

   Water volume: Air: 16 L/ac minimum. Ground: 32 L/ac minimum. Alfalfa weevil: 60 - 80 L/ac on heavy growth.

7. **Application Tips:** Do not apply when crop is in bloom.
8. **How it Works:** Azinphos-methyl is a contact, non-systemic, organophosphate insecticide and acaricide.
9. **Grazing, Cropping and Other Restrictions:** Pre-harvest or pre-grazing interval (days): alfalfa (21), clover (21), potatoes (7), rye (30). Re-entry interval: 48 hours. Do not plant root crops other than those with registered azinphos-methyl uses in azinphos-methyl treated soil sooner than 6 months after last application. Do not plant any crop other than those with registered azinphos-methyl uses in treated soil sooner than 30 days after last application.

Guthion/Sniper (cont'd)

10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 11 mg/kg, 50% wettable powder = 34 mg/kg, spray concentrate = 21 mg/kg. Highly toxic to bees exposed to direct treatment or residues on crops. Poisonous if swallowed, inhaled or absorbed through the skin.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**. **Do not contaminate feed or food**.

    Call a physician immediately. Have patient lie down and keep quiet. **If in eyes or on skin**, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Tightness in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea.

    For physician: Compound inhibits cholinesterase, resulting in stimulation of the central nervous system, the parasympathetic nervous system and the somatic motor nerves. Do **not** give morphine. Watch for pulmonary edema which may develop in serious cases of poisoning even after 12 hours. At first sign of pulmonary edema, the patient should be placed in an oxygen tent and treated symptomatically. **Antidote is atropine sulphate** in large therapeutic doses. Repeat as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine.
12. **Storage:** Do not store spray concentrate below -4°C. Protect products from heat and open flame. Do not heat.

Helix/Helix XTra *(thiamethoxam + difenoconazole + metalaxyl-M + fludioxonil)*

Insecticide – Fungicide

Group 4 *(Insecticide)* **Group 3,4,12** *(Fungicide)*

Manufacturer: **Syngenta Crop Protection Canada Inc.**

CAUTION POISON

1. **Formulations:**

    Helix: Flowable seed treatment, containing 10.3% thiamethoxam, 1.24% difenoconazole, 0.39% metalaxyl-M and 0.13% fludioxonil.

    Helix XTra: Flowable containing 20.7% thiamethoxam, 1.25% difenoconazole, 0.39% metalaxyl-M and 0.13% fludioxonil; 105 L, 200 L, 450 L, 1,050 L Bulk.
2. **Registered Mixes:** None.
3. **Crops:** Canola, mustard.
4. **Insect Controlled:** Flea beetles, duration of control: Helix (14 - 21 days), Helix XTra (28 - 35 days).

    Diseases controlled: Seed-borne *Alternaria*, seed-borne blackleg (*Leptosphaeria maculans*), seedling disease complex (damping off, root rot, seed rot), *Fusarium* spp., *Pythium* spp. and *Rhizoctonia* spp.
5. **When Used:** Seed treatment.
6. **How to Apply:**

    With: Custom application at seed cleaning plant.

    Water volume: Helix and Helix XTra do not require the addition of water for application. Do not dilute with water.

    Rate: Helix and Helix XTra: 1,500 mL/100 kg of seed.

7. **Application Tips:** Available only as pretreated seed.
8. **How it Works:** The active ingredient difenoconazole is a systemic fungicide from the triazole chemical class that provides broad-spectrum protection against seed and soil-borne diseases. Metalaxyl-M is a phenylamide fungicide with systemic activity against diseases caused by the Oomycetes class, including Pythium damping off. Fludioxonil is a phenylpyrole chemistry derived and synthesized from exudates of the soil bacterium *Pseudomonas*, contact and local penetrant properties.

   Thiamethoxam is a systemic insecticide from the neonicitinoid chemical class that acts by interfering with the acetylcholine receptor of the insect's nervous system.
9. **Grazing, Cropping and Other Restrictions:** Do not graze, feed green forage or cut for hay within 55 days of planting. Do not plant any crop other than wheat within 30 days to fields in which treated seeds were planted. Commercially treated seed with Helix must be labeled with the following statement: **"This seed has been treated with thiamethoxam insecticide, fludioxonil, difenoconazole and metalaxyl-M fungicides. Do not use for food, feed or oil purposes."**
10. **Toxicity:** Acute oral LD_{50} (rats) = >5,000 mg/kg – practically non-toxic.
    Acute dermal LD_{50} (rabbits) = >2,000 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes, rinse with lots of water for 15 minutes. Hold eyelids apart to rinse the entire surface of the eye and lids. Do not apply any medicating agents except on the advice of a physician. **If on skin**, remove contaminated clothing and thoroughly wash the affected part of the body with soap and water, including the hair and under the fingernails. **If inhaled**, remove the person to fresh air. Apply artificial respiration if necessary. **If swallowed**, give victim 1 - 2 glasses of water if the person is conscious and induce vomiting. Never give anything by mouth to an unconscious person. Call a physician immediately.
12. **Storage:** Keep in heated storage. Product will freeze at -20°C.

Imidan 50-WP Instapak

(phosmet)

Group 1B

Manufacturer: **United Agri Products**

DANGER POISON

1. **Formulation:** Wettable powder: Imidan 50-WP – 1 kg water soluble sachets; 2 x 1 kg (50% phosmet).
2. **Registered Mixes:** None.
3. **Crops:** Alfalfa, carrots, potatoes.
4. **Insects Controlled:** Alfalfa weevil, carrot weevil, colorado potato beetle, potato flea beetle, potato leafhopper.
5. **When Used:** When first signs of infestation are visible.
6. **How to Apply:**

   With: Ground equipment.

   Carrot: Must be added to spray water first, and sachet must be completely dissolved. Use up to 405 L of water per acre. Apply only twice per season. Do not apply 40 days prior to harvest.

Alfalfa: Must be added to spray water first, and sachet must be completely dissolved. Use 81 to 202 L of water per acre. Maximum of one application per cutting. Do not apply during bloom. Do not apply 7 days prior to harvest.

Potato: Must be added to spray water first, and sachet must be completely dissolved. Use sufficient water to provide good coverage. Apply as required. Do not apply 7 days prior to harvest.

Rate:

Crop	g/ac
Alfalfa	910
Carrot	910
Potato	910

7. **Application Tips:** See *How to Apply*.
8. **How it Works:** Phosmet is a non-systemic, contact, organophosphorous insecticide.
9. **Grazing, Cropping and Other Restrictions:** Do not apply 7 days prior to harvest on alfalfa or potatoes. Do not apply 40 days prior to harvest on carrots. This product is toxic to fish. Keep out of any body of water. This product is toxic to bees. Do not apply when fruits or cover crops are in bloom.
10. **Toxicity:** Acute oral LD_{50} (rats) = 285 mg/kg.
11. **Precautions, First Aid: If in eyes**, immediately flush the eyes with running water for a **minimum** of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention immediately. **If on skin**, flush skin with running water for a **minimum** of 20 minutes. Start flushing while removing contaminated clothing. If irritation persists, repeat flushing. Obtain medical attention immediately. **If inhaled**, move victim to fresh air. Give artificial respiration only if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing and no pulse. Oxygen administration may be beneficial in this situation but should only be administered by personnel trained in its use. Obtain medical attention immediately. **If swallowed**, if victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. **Immediately** contact local Poison Control Centre. Vomiting should only be induced under the direction of a physician or a Poison Control Centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in vomitus, rinse mouth and administer more water. **Immediately** transport victim to an emergency facility. Phosmet is a cholinesterase inhibitor. Atropine is antidotal. 2-PAM (pralidoxime) is also antidotal when administered early and in conjunction with atropine.

    Symptoms: Symptoms of poisoning include nausea, headache, weakness, impaired vision, sweating, tightness in the chest, convulsions.
12. **Storage:** Store above 0°C. Keep water soluble sachets in its protective container and store in a cool, dry place. Do not store at temperatures above 40°C.

Lannate *(methomyl)*

Group 1A

Manufacturer: **DuPont Canada Inc.**

DANGER POISON CAUTION FLAMMABLE

1. **Formulations:** Soluble powder; 90%; 24 x 225 g Toss-N-Go water soluble pouches; 5.4 kg/case. Liquid formulation: 215 g/L, 10 L per jug, 2 jugs/case.
2. **Registered Mixes:**

   Mixing instructions: Fill spray tank 1/4 - 1/2 full of water. Add the appropriate number of water soluble pouches directly to spray tank, mix thoroughly. Once dissolved, continued agitation is not required. Do not use air agitation; use mechanical or hydraulic agitation.
3. **Crops:** Barley, canola, flax, oats, peas, potatoes, sweet corn, wheat.
4. **Insects Controlled:**

   alfalfa looper
   aphids
   beet webworm
   Bertha armyworm
   clover cutworm
   common armyworm
   corn earworm
   European corn borer
   flax bollworm
   flea beetle
   leafhopper
   thrips
   variegated cutworm
5. **When Used:** When insects are causing economic damage; continue applications at 5 - 7 days intervals or as needed. No restriction on number of applications. Early morning or late evening sprays are recommended.

   Aphids: Apply up to 3 applications at 5 day intervals.

   Corn earworm: Apply 4 sprays at 2 - 4 day intervals beginning when 25% of the ear shows silk.

   European corn borer: Apply at 5 day intervals when egg masses begin to hatch.
6. **How to Apply:** Refer to the label for application instructions.

   With: Aircraft (barley, canola, flax, oats, wheat) or ground equipment (all crops).

   Rate: Low rate only for very young insects, small plants or light infestations.

Crop	Insect	g/ac
Barley, oats, wheat	Common armyworm	109 - 218
	Thrips	121
Canola	Alfalfa looper, armyworm, Bertha webworm, beet webworm, clover cutworm	87 - 206
	European comborer	250
Flax	Bertha armyworm, flax bollworm	89 - 109
Peas	Alfalfa looper, aphids	200
Potato	Aphids, flea beetles, leafhoppers	215
	Varigated cutworm	109 - 218
Sweet corn	Aphids, corn earworm	175 - 250
	European corn borer	253

   Water volume: Air: 9 L/ac minimum. Ground: 40 - 140 L/ac.

7. **Application Tips:** Refer to the label for application instructions.
8. **How it Works:** A carbamate insecticide that works by contact and ingestion and has some systemic action. Rapidly degraded in green, growing plants; short-term residual. Rapid knock-down.
9. **Grazing, Cropping and Other Restrictions:** Pre-harvest interval (days): barley, oats, wheat (20); canola, flax (8); peas (1); potatoes, sweet corn (3).

Lannate (cont'd)

10. **Toxicity:** High acute mammalian toxicity. Acute oral LD$_{50}$ (rats) = technical 17 - 24 m/kg. Toxic to bees. May be fatal or cause blindness if swallowed. Poisonous if inhaled. Causes eye damage. Can be absorbed through the skin. Intake can cause heart, liver and kidney damage.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots (see page 30 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention. Aircraft pilot should not assist in the mixing and loading operation.

    Symptoms of poisoning: Weakness, blurred vision, headache, nausea, abdominal cramps, discomfort in the chest, constriction of pupils, sweating, slow pulse or muscle tremors.

    For physician: Administer atropine sulphate in repeated doses, 1.2 - 2.0 mg intravenously every 10 - 30 minutes until full atropinization is achieved. Maintain atropinization until patient recovers. Do **not** use morphine. 2-PAM may be used to supplement atropine treatment.

    Decontamination:

    Spill or leak procedure: Do not get in eyes, on skin or on clothing. Keep people away and upwind of spill/leak. If necessary to enter the spill area, wear self-contained breathing apparatus, gloves, boots and protective clothing. Remove leaking containers and put them into leak-proof containers. Sweep up spills; apply earth, sand or sweeping compound to spill area and re-sweep to pick up residue. Package spill material in plastic, cardboard or metal containers; dispose in accordance with provinicial regulations. If product enters crevices and cannot be effectively swept, treat with a sodium hydroxide (Drano) water solution and allow to stand 4 hours. Thereafter, flush well with water; do not flush into any body of water. If product enters sewers or bodies of water, notify appropriate local and federal authorities.
12. **Storage:** Store product in original container only. Store away from other pesticides, fertilizer, food or feed. Not for use or storage in or around the home. Do not allow the product to freeze.

Lorsban 4E/ Pyrinex 480 EC/Nufos 4E/ Chlorpyrifos 480 EC *(chlorpyrifos)*

Group 1B

Manufacturer: Dow AgroSciences/United Agri Products/Cheminova Canada/Interprovincial Co-operatives

DANGER POISON

1. **Formulations:** Emulsifiable concentrate; 480 g/L; 10 L jug, 208 L returnable container.
2. **Registered Mixes:** Avenge 200C, Banvel + 2,4-D Amine, Buctril M, 2,4-D Amine, 2,4-D Ester, MCPA Amine, MCPA Ester.

    Mixing restrictions: Do not add adjuvants, surfactants or spreader stickers other than those allowed on mixing partner label. When tank mixing, first add the herbicide to spray tank, then add Lorsban 4E.
3. **Crops:** Barley, canola, field corn, flax, lentils, oats, potatoes, sugar beets, sunflowers, sweet corn, wheat.

4. Insects Controlled:

- alfalfa looper
- army cutworm
- Bertha armyworm
- black cutworm
- Colorado potato beetle larvae
- common armyworm
- dark-sided cutworm
- diamondback moth larvae
- grasshoppers
- lygus bug
- pale western cutworm
- potato flea beetle
- red-backed cutworm
- Russian wheat aphid
- sunflower seed weevil
- tarnished plant bug
- variegated cutworm
- wheat midge

5. When Used:

When economic damage is apparent or when insect numbers reach the economic threshold.

Wheat midge: When adults are found in crop (1 midge/4 - 5 wheat heads). When 25% of wheat head has emerged from boot, but preferably delayed until flowering (in 30% of crop).

Number of applications: Once per season as a foliar, seedling or soil treatment. Maximum of 9 weekly applications on potato foliage.

6. How to Apply:

With: Aircraft or ground equipment.

Rate: Use lower rate for young insects, light infestations or sparse foliage.

Crop	Stage	Insects	mL/ac
Barley, oats, wheat	foliage	Armyworm, army cutworm, dark-sided cutworm, pale western cutworm, red-backed cutworm	355 - 485
		Brown wheat mite	250
		Grasshopper (nymphs)	235
		Grasshopper (adults)	355
		Russian wheat aphid	202
		Wheat midge	335 - 405
Canola	foliage	Alfalfa looper, Bertha armyworm, common armyworm	305 - 405
		Diamonback moth larvae	405
		Grasshoppers	235 - 355
		Lygus bug	202 - 405
Canola, flax	seedling	Army cutworm, dark-sided cutworm, pale western cutworm, red-backed cutworm, variegated cutworm	355 - 485
Field corn, potatoes, sweet corn	preplant	Black cutworm, dark-sided cutworm, red-backed cutworm	970
	seedling	Black cutworm, dark-sided cutworm, red-backed cutworm	485 - 970
Flax	seedling	Bertha armyworm	305 - 405
Lentils (Lorsban only)	seedling	Cutworms	275 - 485
	seedling	Pale western cutworm	355 - 485
	foliage	Grasshoppers	235 - 485
Potatoes	foliage	Colorado potato beetle, potato flea beetle, tarnished plant bug	405
Sugar beets	seedling	Pale western cutworm, red-backed cutworm	485 - 970
Sunflower	seedling	Army cutworm, pale western cutworm, red-backed cutworm, seed weevils	485

Water volume:

Air: 4 - 12 L spray solution/ac.

Ground: 20 - 80 L spray solution/ac.

Nozzles: Flat fan recommended.

Lorsban 4E/Pyrinex 480 EC/Nufos 4E/Chlorpyrifos 480 EC (cont'd)

7. **Application Tips:** Uniform coverage of crop is essential: use a boom configuration that provides optimum coverage. Use higher rates when infestations are heavy and when foliage is dense.

   Bertha armyworm, alfalfa looper and armyworm: Use higher rate for large larvae and when canopy is dense.

   Cutworms: Higher rates and water volumes when the top 1 cm of soil surface is extremely dry or when the infestation is heavy.

   Foliage treatments: When spraying crops near maturity, an application system that gives maximum penetration of the crop canopy is necessary to get good insect kill. Do not apply to crops in bloom. Best results will be obtained when application is made during early evening.

8. **How it Works:** A broad-spectrum, non-systemic insecticide. Works by contact, ingestion and vapour action.

   Expected results: Insects must come in direct contact with the insecticide to be affected. Degrades on foliage by weathering, and a significant kill of insects eating treated foliage may not last beyond 48 hours after treatment. Somewhat more persistent in soil; control of soil-dwelling insects may be more durable.

   Effects of rainfall:

   Foliar treatments: Should be made 4 - 6 hours before forecast rainfall.

   Soil treatment: Do not apply if heavy rainfall is forecast. A light rainfall during or after application is probably helpful.

   Movement in soil: Binds to organic matter in soil and is not likely to leach in soils with some organic matter.

9. **Grazing, Cropping and Other Restrictions:**

   Re-entry restriction: Do not enter treated field for at least 24 hours after application.

   Application restrictions: Barley, oats, wheat: Do not apply more than 2 times per season or more than a total of 2.4 L/ha. See label for restrictions on other crops.

   Pre-harvest interval (days): Barley, oats, wheat (60), canola (21), corn – field and sweet only (70), flax (21), lentils (21 for applications up to 875 mL/ha), (60 for applications greater than 875 mL/ha), potatoes (7), sugarbeets (90), sunflowers (42).

   Grazing restrictions: Cereals grown for cover crop treated with Lorsban insecticide should not be harvested for human or animal consumption if treated within 60 days of harvest.

10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50}(rats) formulation = 440 - 900 mg/kg. Toxic to fish. Toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Avoid use when bees are actively foraging.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. Get medical attention for eyes. **If swallowed**, seek medical attention.

    Symptoms of poisoning by inhalation: Stuffy, runny nose, scratchy throat, asthmatic wheezing, sudden bronchospasm, swelling of oral and laryngeal mucous membranes, shock.

    For physician: Contains a cholinesterase inhibitor and a solvent. **Antidote is atropine**.

12. **Storage:** Combustible liquid; keep away from heat, sparks and open flame.

Malathion/Fyfanon 50% EC

(malathion)

Group 1B

CAUTION POISON

Manufacturer: **United Agri Products/Interprovincial Co-operatives Ltd./Cheminova Canada**

1. **Formulations:** Emulsifiable concentrates: Malathion (50% EC); 500 g/L; 4 x 4 pack; 2 x 10 L. Grain protector dust: Malathion (2%); 22.7 kg bag. Grain protectant; Malathion (5%); 20 kg bag. Fyfanon 50% EC, 500 g/L, 10 mL jug.
2. **Registered Mixes:** None.
3. **Crops:** Alfalfa, barley, canary seed, canola, clover, corn, flax, lentils, mustard, oats, pasture, peas, potatoes, rye, stored grain, sugar beets, sweet clover, wheat.
4. **Insects Controlled:**

Foliar spray

alfalfa weevil larvae
aphids
armyworms
corn earworm
diamondback moth larvae
English grain aphid
European corn borer
flea beetles
grasshoppers
greenbug
leafhoppers
lygus bug
spider mite
spittle bug (adults)
sweet clover weevil
winter grain mite

Stored grain treatment

confused flour beetle
flat grain beetle
grain mites
granary weevil
Indian meal moth
lesser grain borer
red flour beetle
rice weevil
rusty grain beetle
saw-toothed grain beetle

5. **When Used:**

Foliar spray: Legumes: When economic thresholds are reached. Do not apply to legumes in bloom. Sweet clover: Spray field margins of first year clover in late summer or early fall when migration of weevil adults is occurring. Canola, flax: When bees are absent from field and temperatures is above 18°C. Sugar beets: At 3 - 5 leaf stage when insects or damage first appears.

Stored grain treatments: As grain is being loaded or turned into final storage. Surface protectant – immediately after grain is loaded into storage.

Storage protectant: Prior to filling of grain storage structures.

6. **How to Apply:**

Emulsifiable concentrates

With: Aircraft or ground equipment.

Rate: Use lower rate for immature insects, light infestations or sparse foliage.

Crop	Insects	L/ac
Alfalfa	Alfalfa weevil larvae, aphids, grasshoppers, leafhoppers, lugus bugs, spittlebugs (adult), spider mites	0.91 - 1.1
Barley, oats, wheat	Armyworms, English grain aphids, greenbugs, winter grain mites	0.44 - 1.01
Canola, flax, mustard, pasture	Grasshoppers	0.4 - 1.1
Clover	Aphids, grasshoppers, leafhoppers, spider mites	0.91 - 1.1
Flax	Grasshoppers	0.44 - 0.78
Grain corn, forage corn	Earworms, European corn borer	0.91 - 1.1
Rye	Cereal leaf beetle	0.9

Malathion/Fyfanon 50% EC (cont'd)

Water volume: Potato pests - 400 L/ac.

Nozzles: Flat fan recommended.

Stored grain treatments

With: Spray or dust applicators.

Rate:

Insect	Grain	Liquid g/1,000 kg grain	0.5% Dusts g/1,000 kg grain	2.0% Dusts
Confused flour beetle, flat grain beetle, grain mites, granary weevil, Indian meal moth, lesser grain borers, red flour beetle, rice weevil, rusty grain beetle, saw-toothed grain beetle	Barley	12	2000	520
	Corn	10	–	–
	Oats	17	3000	735
	Rye	10	1750	450
	Wheat	10	1750	415
Indian meal moth	Barley, corn, oats rye, wheat	300 mL/$100 m^2$ of grain surface	–	–

Note: The Canadian Grain Commission does not recommend the use of grain protectants. Malathion is more effective in dry grain than in tough or damp grain because the pesticide breaks down rapidly.

Water volume: 10 - 20 L water; Indian meal moth (surface treatment) 5 - 10 L water.

Incorporation: Add to grain as it is being augered, or scatter proper amount of dust on each load and cut in with shovel before dumping.

Nozzles: Flat fan recommended.

7. **Application Tips:**

All crops: Apply when day temperature is expected to exceed 20°C. Do not apply to plants in bloom.

Stored grain: To protect from Indian meal moth, spray evenly over the surface of uninfested grain and rake to a depth of 15 cm. Where special application equipment is not available, any type of low pressure sprayer holding 5 L or more can be used. Apply spray to the grain stream as it is being elevated into storage. Test sprayer calibration by discharging into a tank of water, then regulate flow of grain to get the proper rate of spray. Keep spray coarse to avoid loss as "drift."

Before storing new grain: Thoroughly clean up old grain and debris from bins, elevators or grain handling equipment. Remove and burn all sweepings. After cleaning the premises, apply a residual malathion spray to walls, floors and machinery in grain elevators or farm storage, using 200 mL Grain Protectant/5 L water. Force spray into cracks and crevices. Apply at 5 L of spray/100 m^2 of surface area using a coarse wetting spray. Wait until spray has thoroughly dried before storing grain in treated areas. Spray this mixture around the outside of bins and elevators to help prevent the insects from entering the bins.

8. **How it Works:** A non-systemic, contact, organophosphate insecticide and acaricide of brief to moderate persistence. Generally non-phytotoxic. Do not apply foliar sprays at temperatures below 20°C.

9. **Grazing, Cropping and Other Restrictions:** Pre-harvest and pre-grazing intervals (days): canola (7), cereals (7), flax (7), hay (7), legumes (7), mustard (7), pastures (0), potatoes (3).

Forages and pasture: Remove cattle before spraying; cattle may be returned immediately after spraying.

Stored grain sales: Do not apply within 7 days of selling grain. Do not apply to barley destined for malting.

10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD$_{50}$ (rats) = 2,800 mg/kg. Highly toxic to bees and fish.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Headache, weakness, sweating, giddiness, blurred vision, nausea, abdominal cramps, diarrhea and discomfort in chest.

    Notes to physician: It is a cholinesterase inhibitor. Atropinise slowly to avoid cardiac arrest. Do not give respiratory depressants.

    Decontamination: Malathion breaks down rapidly in the presence of water and alkaline materials. Containers and spillages can be readily decontaminated by using Javex, lye or washing soaps that contain sodium hydroxide.
12. **Storage: Flammable.** Do not store near food or feed. Keep container tightly sealed when not being used.

Matador 120EC *(cyhalothrin lambda)*

Group 3

Manufacturer: Syngenta Crop Protection Canada Inc.

DANGER POISON

1. **Formulations:** Emulsifiable concentrate; 120 g/L; 3.78 L jug.
2. **Registered Mixes:** Achieve, Horizon and Tilt.
3. **Crops:** Alfalfa, barley, canola, flax, grain corn, mustard, oats, popcorn, potatoes, summerfallow, sunflowers, sweet corn, unimproved pasture, wheat.
4. **Insects Controlled:**

    alfalfa weevil
    cabbage seedpod weevil
    Colorado potato beetle
    corn earworm
    crucifer flea beetle
    cutworm
    European corn borer
    fall armyworm
    grasshoppers
    leafhopper
    lygus bug
    pea aphid
    potato leaf hopper
    sunflower beetle
    tarnished plant bug
    tuber flea beetle
5. **When Used:** When economic damage is apparent.

    Colorado potato beetle: Apply when insects or damage appears. Use the high rate once larvae are past the second instar. Timing of applications should be based on the presence of vulnerable pest developmental stages and significant populations as determined by local monitoring. Colorado potato beetle susceptibility to pyrethroid insecticides should be confirmed using an appropriate assay.

    Crucifer flea beetle: To prevent migration of overwintering flea beetle adults throughout the field, ground spray a 15 m strip around the field at the first sign of flea beetle feeding.

    Grasshoppers: Best results on young, non-flying grasshoppers (up to 3rd nymphal stage, up to 1 cm in length) or when insect numbers are low. Use higher rate when grasshopper are larger, up to but not including winged adults (up to 2.5 cm in length) or when insect numbers are high. If insect migration into a field is severe, apply a spray to a 15 m strip around the field.

Matador 120EC (cont'd)

6. **How to Apply:**

Ground equipment: All registered crops. Do not apply within 15 m of productive fisheries, water or waterfowl habitat.

Aircraft: Matador is only registered for aerial application on the following crops: alfalfa, barley, canola, corn, flax, mustard, oats, potatoes, summerfallow, sunflower, unimproved pasture, wheat.

Rate: Use a higher rate for severe infestations, when foliage is dense or when grasshoppers are in the late nymphal or adult stage.

Crop	Insects	mL/ac
Alfalfa	Alfalfa weevil, lygus bug, pea aphid, potato leafhopper, tarnished plant bug	34
Alfalfa, summerfallow, unimproved pasture	Grasshoppers	25 - 34
Barley, oats, wheat	Grasshoppers	25 - 34
Canola, mustard	Cabbage seed pod weevil*, Crucifer flea beetle, lygus bug	34
	Grasshoppers	26 - 34
Field corn, forage corn, popcorn, sweet corn	Corn earworm, cutworm, European corn borer, fall armyworm	34
Flax	Grasshoppers	25 - 34
Potatoes	Potato flea beetle, potato leafhopper, tarnished plant bug, tuber flea beetle	34
	Colorado potato beetle	34 - 51
Sunflower	Sunflower beetle	17 - 26 (ground) 34 (air)

* Adult stage only.

Water volume: Ground: Use sufficient water for thorough coverage, 100 to 200 L/ha (40 to 80 L/ac). Air: 4 - 16 L/ac.

7. **Application Tips:** Control of some insects species with synthetic pyrethroid insecticides decreases as temperature rises. For best results, apply Matador 120EC during early morning before temperature rise and during the evening, past the heat of the day. Temperature must be warm enough for insects to be active.

8. **How it Works:** Cyhalothrin-lambda is a photostable, synthetic pyrethroid insecticide. It is a fast acting stomach and contact insecticide effective against a broad spectrum of foliar pests. It has no fumigant or systemic activity. Best results will be obtained with Matador 120EC when applied against the early developmental stages of the pest as determined by regular monitoring.

9. **Grazing, Cropping and Other Restrictions:** Pre-harvest interval (days): Barley, oats, wheat, (28); canola, flax (50); potatoes (7); sunflowers (70). Do not allow livestock to forage treated fields within 14 days of application. Do not graze or feed lactating dairy animals on treated green cereal forage or treated pasture. Do not use more than 2 applications of the high rate on potatoes or 3 applications per year in all other situations.

10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (female rats) Matador 120 = 278 mg/kg; technical = 56 mg/kg. Skin and eye irritant. Very toxic to fish and other aquatic organisms. This product is toxic to bees and other beneficial insects. Avoid spraying when bees are foraging. Do not re-enter treated areas until 24 hours after treatment. If early re-entry into treated areas is required, workers must wear long pants, long sleeved shirts, chemical resistant gloves, boots and a hat.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Avoid splashing into eyes or on skin, particularly the face. If hands are contaminated, wash with soap and water before touching other areas of skin. When applying this product, workers should wear long pants, long sleeved shirts and chemical resistant boots. In addition, during mixing, loading, cleanup and repair activities, workers must also wear chemical resistant gloves, safety goggles and a face shield (see page 27 for further information). Avoid touching face with contaminated gloves and clothing. Wash gloves before removal. Wash protective equipment with soap and water after each use. For directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. Get medical attention for eyes. **If swallowed**, do not induce vomiting. Get medical attention or call Poison Control Centre immediately.

12. **Storage:** Store in a cool, well ventilated area away from food or feed and out of the reach of children and animals. Store above 0°C. Storage below 0°C will not impair the effectiveness of Matador 120EC; however following such storage, agitate well before use.

Monitor *(methamidophos)*

Group 1B

Manufacturer: Bayer CropScience

DANGER POISON

1. **Formulations:** Liquid; 480 g/L; 10 L pail.
2. **Registered Mixes:** Compatible with most commonly used fungicides.
3. **Crops:** Canola, potatoes.
4. **Insects Controlled:**

aphids	Colorado potato beetle	potato flea beetle
Bertha armyworm	grasshoppers	potato leafhopper

5. **When Used:**

Canola: Bertha armyworm: when larvae number 20 or more /m² and are feeding on pods or flowers; maximum 2 applications per season.

Grasshoppers: Application should begin when migration of grasshoppers from ditches and field borders becomes apparent; maximum 2 applications per season.

Potatoes: Apply in a 10 - 14 day program when necessary.

How to Apply:

With: Aircraft or ground equipment.

Rate: Higher rate for severe infestations, adult insects or dense foliage.

Crop	Insects	ml/ac
Canola	Bertha armyworm	233 - 500
	Grasshoppers	500
Potato	Aphids, Colorado potato beetle, potato flea beetle, potato leafhopper	707 - 910

Water volume: Air (canola): 4 L/ac minimum. Ground: 80 - 400 L/ac.

Nozzles: Flat fan recommended.

Application Tips: Avoid use during flowering and pollination periods.

Monitor (cont'd)

8. **How it Works:** Methamidophos is a broad spectrum, organophosphorus insecticide and acaricide that works by contact and systemic action. Non-phytotoxic when used as directed. Contact effectiveness may persist for 7 - 21 days.
9. **Grazing, Cropping and Other Restrictions:** Pre-harvest interval (days): canola (10), potatoes (14).
10. **Toxicity:** High acute mammalian toxicity. Acute oral LD$_{50}$ (rats) = 95% technical 13 - 15 mg/kg. Monitor = 17 - 20 mg/kg. Extremely toxic to wildlife. Highly toxic to bees exposed to direct treatment or residues on crops. Can cause burns to both skin and eyes.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Tightness in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea. In case of poisoning, get medical attention immediately.

    For physician: Antidote is atropine sulphate administered in large therapeutic doses, repeated as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine. Do **not** give morphine.
12. **Storage:** Store and display apart from food or feed. Do not store in or around the home. Store in a cool, dry place but not below -10°C. Protect from heat.

Orthene 75% *(acephate)*

Group 1B

Manufacturer: **Arvesta Corporation**

1. **Formulations:** Soluble powder 75%.
2. **Registered Mixes:** None.
3. **Crops:** Field corn, potato, sweet corn.
4. **Insects Controlled:**

    Colorado potato beetle
    European corn borer
    green peach aphid
    potato aphid
    potato flea beetle
    potato leafhopper
    tarnished plant bug

    Insects suppressed: Not applicable.
5. **When Used:** Begin treatment when eggs or insects first appear.
6. **How to Apply:**

    With: Ground equipment. Do not apply by air.

    Rate:

Crop	Insects	g/ac
Field corn, sweet corn	European corn borer	300 - 440
Potato	Green peach aphid, potato aphid, potato flea beetle, potato leafhopper, tarnished plant bug	300 - 440

Water volume: Corn: 90 - 400 L/ac; Potatoes: 90 - 660 L/ac.

7. **Application Tips:** Do not apply more than four times per season.
8. **How it Works:** Systemic insecticide: Stomach poison.
9. **Grazing, Cropping and Other Restrictions:** Preharvest intervals depend on the crop. Do not feed trimmings to livestock or allow animals to graze on treated areas. Do not feed corn fodder or forage from treated crop to livestock. Pre-harvest interval (days): corn (21); potatoes (21).
10. **Toxicity:** Toxic. Acute oral LD_{50} (rats) = 605 - 1,100 mg/kg. Toxic to fish and wildlife. Highly toxic to bees.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Orthene is a cholinesterase inhibitor. **Atropine is the antidote**. 2-PAM may also be used in conjunction with atropine but should not be used alone.
12. **Storage:** Store in cool, dry place. Protect from excessive heat.
13. **Resistance Management:** To reduce the potential for target pests to develop insecticide resistance, the use of acephate should be alternated with products of differing modes of action.

Phostoxin *(aluminum phosphide)*

Restricted Uses

Group 8B

Distributors: Abell Pest Control Inc. (Restricted Use)

DANGER POISON

Note: This product is available only to provincially licensed persons.

1. **Formulations:**

    Tablets (3 g); release 1.0 g phosphine upon decomposition.

    Pellets (0.6 g); release 0.2 g phosphine upon decomposition.

    Sache (34 g); release 11.0 g phosphine upon decomposition.

    Order directly – Gastoxin – Garden City Ag. Supplies: 1-888-320-8101; Phostoxin – Garden City Ag. Supplies: 1-888-320-8101; Gardex Chemicals Ltd.: 1-204-989-4790 (Collect).
2. **Registered Mixes:** None.
3. **Crops:** Raw agricultural products, grain or feeds.
4. **Insects Controlled:**

    Angoumois grain moth
    bean weevil
    cadelle
    cigarette beetle
    dermestids
    dried fruit moth
    flour beetles
    granary weevils
    Indian meal moth
    khapra beetle
    lesser grain borer
    Mediterranean flour moth
    rusty grain beetle
    saw-toothed grain beetle
5. **When Used:** When the temperature is above 5°C.

Phostoxin (cont'd)

6. How to Apply:

Rate:

Uses	Tablets
Raw agricultural commodities, animal feeds and processed foods	4 - 6/m^3

Commodity temperature °C	Exposure times (days)
Over 20	3
16 - 20	4
12 - 15	5
5 - 11	10
Below 5	Do not fumigate

Note: Suggested exposures should be observed. A shortened exposure period cannot be compensated for by increased dosage.

7. Application Tips:

General: Never fumigate alone. Never fumigate any structure occupied by man or animals or physically adjoining another structure occupied by man or animals. Personnel involved in fumigation must leave the structure within 2 hours of starting fumigation. Person supervising must be a licensed fumigator and personnel assisting must be trained and appropriately licensed in the use of aluminum phosphide.

Fumigating grain storages: Make sure the structure is tight enough to retain the fumigant. Seal the structure as necessary. During fumigation leave all doors, vents, etc. open to create a cross-ventilation in the structure. Tablets may be probed into grain or fed into the grain stream as the grain is transferred from one bin to another. Probing requires a pipe 3 cm in diameter and long enough to reach within 1.5 m of the bottom of the storage. Probes are made in a 1.5 m horizontal grid across the grain surface. Fumigant tablets are dropped down the pipe at 15 cm intervals as the pipe is withdrawn from the grain. The objective is to distribute the tablets as evenly as possible throughout the grain mass. To achieve the proper dosage when treating a stream, apply the tablets uniformly to the grain stream based on flow rate. After application, all openings should be sealed and entries locked and placarded. After the exposure period, open doors and windows for aeration. Remove all warning placards when aeration is complete.

8. How it Works: Phosphine (hydrogen phosphide) is a colourless gas with a carbide-like odour and high volatility. Formulated product consists of aluminium phosphide, ammonium bicarbonate, urea and paraffin. Upon exposure to air, the ammonium bicarbonate breaks down to form ammonia (a pungent, warning gas) and carbon dioxide (a fire suppressant). Within 1 - 4 hours, depending on temperature and humidity, the product begins to decompose and release phosphine. After decomposition, there remains a grey-white dust composed almost entirely of non-poisonous aluminum hydroxide with trace amounts of undecomposed aluminum phosphide. The dust is eliminated when raw agricultural commodities are moved.

Expected results: The effectiveness of this product depends on the fumigation achieved by the release of phosphine gas. Therefore, tightness of the area to be fumigated and temperature of the commodity are essential when determining dosage rates and exposure rates. The tighter the bin and the warmer the temperature of the commodity, the lower the dosage required and vice versa.

9. Grazing, Cropping and Other Restrictions: Aerate finished food for 48 hours before it is offered to the consumer.

10. Toxicity: Hydrogen phosphide gas is very toxic to all forms of animal life, and exposure to even small amounts should be prevented. Poisoning results from ingestion or inhalation as hydrogen phosphide is not absorbed through the skin. It is also insoluble in water, fats and oils.

11. Precautions, First Aid:

Protective equipment: It will be necessary to wear a gas mask if the treated area is entered prior to aeration. It is not necessary to wear a gas mask when product is applied according to label directions. Wear gloves of cotton or other breathable material when handling the product. Only open containers in open air and with the opening pointing away from your face. Wash hands after use of the product.

Reduce gas hazards: Never let tablets come in direct contact with liquid – this contact causes the immediate release of hydrogen phosphide. **Never** open a container except for immediate usage. **Never** confine the product in small gas proof enclosures such as plastic bags. Such confinement could cause the gas concentration to reach the lower flammability level. Take precautions in areas where copper, brass or gold are present, as corrosion may occur. **Never** fumigate in areas containing electronic or telephone equipment, photographic film or copy paper. Remove such items or protect them from exposure to the gas. Hydrogen phosphide has great penetrating power, and gas may slowly seep through concrete block walls. Hydrogen phosphide does not layer, but expands to fill the available space.

Symptoms of poisoning: Severity depends on concentration of hydrogen phosphide involved. **Mild poisoning** results in fatigue, nausea, pressure or pain in the chest, ringing in the ears and uneasiness. Hydrogen phosphide is not a chronic poison, and these symptoms will readily disappear with rest and fresh air. **Greater quantities of gas** produce such symptoms as vomiting, stomach ache, diarrhea, disturbance in equilibrium and dyspnea (difficulty in breathing). Very high concentrations quickly cause bluish-purple skin colour, agitation, poor muscle co-ordination, sub-normal blood oxygen content, unconsciousness and death. Death can occur very quickly or be delayed several days as a result of pulmonary edema and collapse, by paralysis of the central respiratory system. In cases of severe poisoning, disturbance in liver and kidney function can also occur.

First aid: Should exposure to hydrogen phosphide be documented or suspected – remove patient from gas atmosphere to open air. **Call a physician immediately**. Have the patient lie down, keeping him warm and comfortable. Treat as for shock. Make **no** antidotal use of fats, oil, butter or milk. Do **not** administer atropine as it is contraindicative. Begin artificial respiration if breathing has ceased. When exposure to low concentrations of hydrogen phosphide have been documented or suspected, the individual involved should rest for 24 hours, and under no circumstances should he resume any work dealing with fumigation. If ingested, induce vomiting by touching the back of the throat with a blunt object.

12. Storage: Tablets are received in resealable flasks. As long as flasks remain intact, the storage life of the product is unlimited. Storage should be in a dry, locked, ventilated area and out of the reach of children and irresponsible persons.

Poncho *(clothianidin)*

Group 4

Manufacturer: **Gustafson**

1. **Formulation:** Flowable; clothianidin 600 g/L , 100 L.
2. **Registered Mixes:** None.
3. **Crops:** Corn.
4. **Insects Controlled:** Corn aphid, corn seed maggot, cutworm, flea beetle, grubs, wireworm.
5. **When Used:** Seed treatment.
6. **How to Apply:** Available pretreated from corn seed supplier.

   Rate: 33 mL per seed unit.

Poncho (cont'd)

7. **Application Tips:** Available only as pretreated seed.
8. **How it Works:** Clothianidin is a systemic chloronicotinyl insecticide. It protects the seed and developing plant from insect damage.
9. **Grazing, Cropping and Other Restrictions:** Corn and canola may be replanted at any time. A one-year plant back interval is required for leafy, root and tuber vegetables. A 30-day plant back on cereal grains, grasses, non-grass animal feeds, soybean and dried beans is required.
10. **Toxicity:** Acute oral LD_{50} (rats) = formulation >5,000.
11. **Precautions, First Aid: Do not** get into eyes. May irritate eye. Work in a well-ventilated area when handling Poncho insecticide-fungicide or Poncho insecticide-fungicide treated seed. Workers involved in treating, cleanup, or maintenance of seed treatment equipment, bagging, sewing or stacking must wear coveralls over long-sleeved shirt and long pants, chemical-resistant gloves, head gear, and respiratory protection (i.e., half-mask respirator with suitable dust filter or fresh air hood). **Do not** use leather or cloth gloves. Avoid breathing vapours. Alcoholic beverages should be avoided for 24 hours before and after working with Poncho insecticide-fungicide or treated seed, because of possible unpleasant side effects. Use good personal hygiene, washing hands and exposed skin with warm water and soap before eating, drinking or smoking. No food, drink or tobacco should be allowed in areas of chemical storage or use. **Do not** use treated seed for food, feed or oil processing. Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children and animals**.

    If in eyes, immediately wash with running water for 15 minutes. Obtain medical attention. **If on skin**, remove contaminated clothing. Wash exposed areas of skin with soap and water. **If swallowed**, **do not** induce vomiting unless told to do so by a poison control centre or doctor. **Do not** give anything by mouth to an unconscious person.
12. **Storage:** Store to prevent cross contamination with other pesticides, fertilizers, food and feed. Store in original container and out of reach of children.

Pounce *(permethrin)*

Group 3

Manufacturer: **United Agri Products**

CAUTION FLAMMABLE

1. **Formulations:** Emulsifiable concentrates; Pounce 384 g/L, 1 L, 6 x 1 L.
2. **Registered Mixes:** None.
3. **Crops:**

    barley
    canola
    corn
    flax
    lentils
    oats
    peas
    potatoes
    rye
    sugar beets
    sunflowers
    wheat
4. **Insects Controlled:**

    army cutworm
    Colorado potato beetle
    corn earworm
    European corn borer
    fall armyworm
    pale western cutworm
    potato flea beetle
    potato leafhopper
    red-backed cutworm
    tarnished plant bug
5. **When Used:** Post-planting treatment.

    Air: Apply only once per season.

    Corn borer, corn earworm: Spray no later than when first feeding damage is seen on foliage.

    Cutworms: Applications should be made under warm, moist conditions in the evening or at night when cutworm activity is highest.

6. **How to Apply:**

With: Aircraft or ground equipment.

Rate: Use higher rate for heavy infestations, when adult insects are present, foliage is dense or for cutworms when soil is dry and/or larvae are large.

Crop	Insect	mL/ac
Sugar beets, sunflowers, wheat	Army cutworm, black cutworm, dark-sided cutworm, pale western cutworm, red-backed cutworm	73 - 158
Barley, oats, rye, wheat	Pale western cutworm	73 - 158
Potato	Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug	75 - 110
Sweet corn	Corn earworm, European corn borer	111 - 152
	Fall armyworm	73

Water volume: Corn: 140 - 180 L/ac. Potato: sufficient water for thorough coverage of foliage.

Nozzles: Flat fan recommended.

7. **Application Tips:** Corn: Corn earworm, spray to ensure coverage of ears and silk. European corn borer control, consult with provincial personnel for proper timing of spray. Cutworms: Do not disturb soil surface for 5 days after application.

8. **How it Works:** Works by contact and as a stomach poison on a wide range of pests. No systemic or fumigant activity.

9. **Grazing, Cropping and Other Restrictions:** Cover crop or crop treated with permethrin should not be used as a green feed for animals. Pre-harvest interval (days): corn (1), potatoes (1).

10. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) Ambush 500 EC = 3,000 mg/kg, Pounce EC = 1,030 mg/kg. Severe eye irritant. Very toxic to bees and fish. Do not spray when bees are foraging. Spray deposit should be dry before bees begin foraging in treated crops.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes of Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention immediately. Do not induce vomiting as this product contains petroleum distillates.

    Caution: Studies have shown that synthetic pyrethroid insecticides can be 1,000 - 10,000 times more toxic to fish than many other insecticides in common use. Careless use of these insecticides can seriously harm sport and commercial fisheries. Entry of these insecticides into small wetlands such as prairie sloughs can affect invertebrate life that is needed for waterfowl reproduction and fish farming. Maintain a **minimum** 30 metre buffer for ground application and a **minimum** 100 metre buffer for aerial application.

12. **Storage:** Keep product away from fire, open flame, electric light bulbs and other sources of heat. Minimum storage temperature for Ambush 0°C, Pounce -12°C.

Prosper *(clothianidin + carbathiin + thiram + metalaxyl)*

Group 4 *(Insecticide)* **Group 7,M,4** *(Fungicide)*

Manufacturer: **Gustafson**

1. **Formulation:** Flowable; clothianidin 120 g/L + carbathiin 56 g/L + thiram 120 g/L + metalaxyl 4 g/L. 100 L, 1,000 L.
2. **Registered Mixes:** None.
3. **Crops:** Canola, rapeseed.
4. **Insects Controlled:** Flea beetles.

   Diseases controlled: Seed rot and seedling blight caused by *Alternaria* spp., *Fusarium* spp., *Pythium* spp. and *Rhizoctonia solani*. Seed-borne blackleg.
5. **When Used:** Seed treatment.
6. **How to Apply:** Available pretreated from corn seed supplier.

   Rate: 1,250 mL/100 kg of seed.
7. **Application Tips:** Available only as pretreated seed.
8. **How it Works:** Clothianidin is a systemic chloronicotinyl insecticide (Group 4). Prosper 400 will protect up to the 3 to 4 leaf stage of development from flea beetle feeding damage. Carbathiin is a systemic fungicide (Group 7). Thiram is a contact fungicide (Group M). Metalaxyl is a systemic fungicide (Group 4). Fungicides protect seed and developing plant from disease infection.
9. **Grazing, Cropping and Other Restrictions:** Do not use rape greens for human consuption. Corn and canola may be replanted at any time. A one-year plant back interval is required for leafy, root and tuber vegetables. A 30-day plant back on cereal grains, grasses, non-grass animal feeds, soybean and dried beans is required.
10. **Toxicity:** Acute oral LD_{50} (rats) = formulation >5,000.
11. **Precautions, First Aid: Do not** get into eyes. May irritate eye. Work in a well-ventilated area when handling Prosper insecticide-fungicide or Prosper insecticide-fungicide treated seed. Workers involved in treating, cleanup, or maintenance of seed treatment equipment, bagging, sewing or stacking must wear coveralls over long-sleeved shirt and long pants, chemical-resistant gloves, head gear, and respiratory protection (i.e., half-mask respirator with suitable dust filter or fresh air hood). **Do not** use leather or cloth gloves. Avoid breathing vapours. Alcoholic beverages should be avoided for 24 hours before and after working with Prosper insecticide-fungicide or treated seed, because of possible unpleasant side effects. Use good personal hygiene, washing hands and exposed skin with warm water and soap before eating, drinking or smoking. No food, drink or tobacco should be allowed in areas of chemical storage or use. **Do not** use treated seed for food, feed or oil processing. Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children and animals**.

    If in eyes, immediately wash with running water for 15 minutes. Obtain medical attention. **If on skin**, remove contaminated clothing. Wash exposed areas of skin with soap and water. **If swallowed**, **do not** induce vomiting unless told to do so by a poison control centre or doctor. **Do not** give anything by mouth to an unconscious person.
12. **Storage:** Store to prevent cross contamination with other pesticides, fertilizers, food and feed. Store in original container and out of reach of children.

Ripcord/Cymbush *(cypermethrin)*

Group 3

Manufacturer: **BASF Canada/Syngenta Crop Protection Canada Inc.**

WARNING POISON

1. **Formulations:** Emulsifiable concentrate; Cymbush; 250 g/L; 1 L jugs; Ripcord 400 EC; 407 g/L; 6 x 1 L pack.
2. **Registered Mixes:** None.
3. **Crops:**

Cymbush: Canola, corn, mustard, potatoes, sunflowers.

Ripcord: Barley, canola, corn, headlands, potatoes, rapeseed, roadsides, summerfallow, sunflower, wheat.

4. **Insects Controlled:**

- Bertha armyworm
- Colorado potato beetle
- corn earworm
- crucifer flea beetle
- cutworms
- European corn borer
- flea beetles
- grasshoppers
- potato flea beetle
- potato leafhopper
- strawberry weevil
- sunflower beetle
- tarnished plant bug
- tuber flea beetle

5. **When Used:**

Ground: Do not apply more than 3 times per season.

Air: Canola, sunflowers: once per season. Corn, potatoes: up to 2 times per season.

Apply when insects appear or early signs of insect feeding.

6. **How to Apply:**

With: Aircraft or ground equipment.

Cutworms: Ground only.

Rate:

Crop	Insect	Cymbush mL/ac	Ripcord mL/ac
Barley, canola, headlands, roadsides, summerfallow, wheat	Grasshoppers	–	20 - 28
Corn	European corn borer	113	71
Potatoes	Colorado potato beetle, flea beetle, leafhopper	57	25 - 50
	Tarnished plant bug	81	50
	Variegated climbing cutworm	–	70
Canola, mustard (canola only)	Bertha armyworm	80 - 113	36 (air) 28 (ground)
	Crucifer flea beetle	55	–
	Flea beetles	–	20 (ground)
Barley, corn, seedling potatoes, wheat	Army cutworm, black cutworm, dark-sided cutworm, pale western cutworm, red-backed cutworm, white cutworm	–	71
Strawberry	Strawberry weevil	–	71
	Tarnished plant bug	–	100
Sunflowers	Sunflower beetle, sunflower seed weevil	40	28

Ripcord/Cymbush (cont'd)

Water volume:

Ground: Corn, potatoes, strawberries: 120 - 202 L/ac. Cutworms: 80 - 200 L/ac.
Other crops: minimum of 45 L/ac.

Air: Canola (Bertha armyworm), corn (European corn borer), potatoes (Colorado potato beetle, flea beetles, leafhoppers and tarnished plant bug), sunflowers (sunflower beetle): 4.5 - 9.0 L/ac.

Pressure: 250 - 300 kPa.

Nozzles: Flat fan recommended.

7. **Application Tips:**

   Corn: Direct spray to ensure coverage of ears and silk. Consult your local provincial personnel for proper timing of spray.

   Grasshoppers: Avoid application when temperatures are above 25°C. Bees: spray mist must be dried before bees begin foraging in treated crop.

   Cutworms: Spray under warm, moist conditions and do not disturb the soil surface for at least 5 days.

8. **How it Works:** By contact and stomach action. Good residual activity. No systemic or fumigant activity.

9. **Grazing, Cropping and Other Restrictions:** Pre-harvest interval (days): Barley (45), canola (30), corn (5), mustard (30), potatoes (7), strawberries (7), sunflowers (70), wheat (30). Do not graze the treated crops or cut for hay; there are not sufficient data to support such use. 15 m buffer zone from water must be maintained when applying by ground. 100 m buffer zone from water must be maintained when spraying by air.

10. **Toxicity:** Low-moderate mammalian toxicity. Acute oral LD_{50} (rats) cypermethrin = 3,200 mg/kg, Cymbush = 760 mg/kg; Ripcord = 542 mg/kg. Very toxic to bees and fish.

11. **Precautions, First Aid:** Harmful or fatal if swallowed or absorbed through skin. Avoid contact with eyes and clothing. Spray mist must be dried before bees begin foraging in treated crop. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes of Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention immediately. Do not induce vomiting as this product contains petroleum distillates.

    Caution: Studies have shown that synthetic pyrethroid insecticides can be 1,000 - 10,000 times more toxic to fish than many other insecticides in common use. Careless use of these insecticides can seriously harm sport and commercial fisheries. Entry of these insecticides into small wetlands such as prairie sloughs can affect invertebrate life which is needed for waterfowl reproduction and fish farming. Maintain a **minimum** 15 metre buffer for ground application and a **minimum** 100 metre buffer for aerial application. Applications should not be made when wind or rain could favour drift or run-off into lakes and ponds. May explode if heated.

    Notes to physician: It is a CNS depressant. Steroids can be used to reduce inflammation. Avoid aspiration.

12. **Storage:** Store in a heated chemical shed.

Sevin XLR-Plus *(carbaryl)*

Group 1A

Manufacturer: **Bayer CropScience/Peacock Industries Inc.**

WARNING POISON

1. **Formulations:** Liquid suspensions; XLR-Plus; 466 g/L; 10 L jug.
2. **Registered Mixes:** Most formulations are compatible with a wide range of pesticides. Do **not** apply mixes if they are physically incompatible (e.g. curdle or precipitate). Liquid formulations are **not** compatible with diesel fuel, kerosene, fuel oil, aromatic solvents or any Stampede formulation. All formulations are unstable when mixed with alkaline materials such as Bordeaux mixture, lime-sulphur and casein-lime spreaders.

   Mixing instructions: Prepare only the required amount of spray on the day of application. Do not store spray mixtures overnight. Agitate, stir or recirculate all carbaryl sprays prior to use.
3. **Crops:**

alfalfa
barley
canola
clover
field corn
forage grasses
non-crop areas
oats
pastures
potato
rangelands
rye
sweet corn
wheat

4. **Insects Controlled:**

alfalfa caterpillar
alfalfa weevil larvae
armyworm
blister beetles
Colorado potato beetle
corn earworm
European corn borer
fall armyworm
flea beetles
grasshoppers
leafhoppers
potato flea beetle
stink bug
sweet clover weevil
tarnished plant bug
webworm

5. **When Used:** Apply when necessary to prevent economic damage. Do not apply when crops are in bloom.
6. **How to Apply:**

   With: Sevin XLR: aircraft or ground equipment.

   Rate: Lower rate on immature insects, light infestations or sparse foliage. Higher rate for adult insects, severe infestations or dense foliage.

Crop	Insect	XLR-Plus L/ac
Alfalfa, clover	Alfalfa caterpillar, armyworm, webworm	1.0 - 2.1
	Alfalfa weevil larvae	–
	Blister beetle	1.0 - 1.6
	Climbing cutworm	–
	Leafhoppers	1.0 - 1.6
Barley, oats, rye, wheat	Grasshoppers: nymph	0.5 - 1.0
	adult	1.0 - 1.4
Canola (seedlings only, up to 4 weeks after emergence)	Flea beetles	0.2
Field corn, sweet corn	Corn earworm, European corn borer, fall armyworm	1.0 - 1.6
	Grasshoppers: nymph	0.5 - 1.0
	adult	1.0 - 1.4
Potato	Colorado potato beetle	0.5
	Leafhopper	0.5
	Potato flea beetle	0.5
Ditch banks, field borders, forage grasses, headlands, pastures, rangeland, rights-of-way, wasteland	Grasshoppers (nymphs or sparse vegetation)	0.5 - 1.0
	Grasshoppers (adults or dense vegetation)	1.0 - 1.4

Sevin XRL-Plus (cont'd)

Water volume: Aircraft: 4 L/ac minimum. Ground: 12 L/ac minimum. Sevin XLR-Plus applicaitons are more resistant to wash-off when applied as a concentrated suspension. To ensure wash-off resistance, apply dilutions 1 part Sevin XLR to no greater than 39 parts water. Application should be made to dry foilage to maximize wash-off resistance.

All crops: Use sufficient water to obtain thorough and uniform coverage of spray depending on equipment, severity of infestation and stage of crop growth.

Low volume air applications: Hot, dry conditions may cause excessive evaporation of droplets. A higher spray volume per acre may be required under hot, dry conditions and when crop canopies are particularly dense.

Nozzles: Low volume applications: 50-mesh, in-line strainers and 25-mesh, slotted strainers behind the nozzle; cone type nozzles, sizes D6-45 or D8-45.

Note: Flat fan nozzles may be used, but care should be taken as excessive droplet breakup and resulting production of fine droplets may occur. Flat fan nozzles are also prone to plugging under hot, dry conditions.

7. **Application Tips:** Timing and good coverage are essential for effective control. Calibrate spray equipment to deliver the required volume. Agitate, stir or recirculate all carbaryl formulations prior to use.

   Corn: Treat entire plant for larvae in whorls or on foliage. Spray in a 25 - 30 cm band over the row for climbing cutworms. Apply at 2 - 4 day intervals, if necessary, for insects attacking silks and ears; start when first silks appear and continue until silks begin to dry (3 or more applications may be needed).

   Alfalfa weevil: If pre-treatment damage is extensive, cut and make application to stubble.

8. **How it Works:** A carbamate insecticide that works by contact and ingestion. Moderate to rapid in speed of action with moderate to long residual effectiveness (2 days to 4 weeks) depending on crop/pest complex, formulation and climatic conditions.

   Expected results: Some immediate control is expected, but the majority of control occurs 24 - 48 hours after application.

   Effects of rainfall: Do not apply just before rain.

   XLR-Plus: Maximum resistance to wash-off is obtained when dilutions are not greater than 1:39 (XLR-Plus:water).

   Movement in soil: None.

9. **Grazing, Cropping and Other Restrictions:** Pre-harvest or pre-grazing interval (days): Barley (28), oats, rye, wheat (14); corn (1); potatoes (7). Alfalfa, clovers (2), forage grasses, non-crop areas, pasture, rangeland (1 - 2). Remove cattle from area to be sprayed. Treated forage and feed crops may be fed to dairy animals and animals for slaughter provided sprays are applied as directed. Beef cattle may be re-introduced to range 1 day after application; dairy cattle after 2 days.

10. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = 540 mg/kg. Although carbaryl is toxic to honey bees, Sevin XLR and XLR-Plus have a reduced honey bee hazard warning; do not apply directly to foraging bees.

11. **Precautions, First Aid:** Can be absorbed through the skin. Ensure the residue on the plants is dry before foraging begins. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Salivation, tearing, urination, defecation, pinpoint pupils, muscle spasms, general muscular weakness, nausea, prostration, convulsions.

    For physician: Carbaryl insecticide is a moderate, reversible cholinesterase inhibitor. **Atropine is antidotal**. Do not use 2-PAM opiates or cholinesterase inhibiting drugs.

2. **Storage:** Do not store where temperature frequently exceeds 38°C. All formulations will withstand freezing.
3. **Resistance Management:** Sevin is a Group 1A insecticide. Any insect population may contain individuals naturally resistant to this product and other Group 1 insecticides. The resistant biotypes may dominate the insect population if these insecticides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action, but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

Thimet *(phorate)*

Group 1B

Manufacturer: BASF Canada

DANGER POISON

1. **Formulations:** Granular; Thimet 15-G; 15%; 25 kg bag; 20 kg Lock and Load.
2. **Registered Mixes:** None.
3. **Crops:** Potatoes.
4. **Insects Controlled:**

aphids
Colorado potato beetle
leafhopper
lygus bug
thrips

Insects suppressed: Potato flea beetle, wireworm.

5. **When Used:** One application at planting time only.
6. **How to Apply:**

With: Granular pesticide applicator.

Rate:

Crop	Insects	Quantity
Potatoes	Aphids, Colorado potato beetle (early season control), leafhopper, leaf miners, psyllids, reduction of potato flea beetle and wireworm damage, tuber flea beetle	140 g/100 m row (sandy soils) 215 g/100 m row (slit to clay soils)

7. **Application Tips:** Beans: distribute in the row to the side of the seed. Potatoes: distribute evenly in the furrow on each side of the row. Do not place in direct contact with the seed. Do not use in muck soils. Do not apply to any area not specified on the label. Do not apply later than at planting time of potatoes.
8. **How it Works:** A systemic, organophosphorus insecticide with effective initial residual activity against soil insects and other arthropods.

Expected results: Only early season control of Colorado potato beetle. Reduction of potato flea beetle and wireworm damage.

Effects of rainfall: Relatively insoluble in water, therefore, the effect of normal rainfall is not appreciable.

Movement in soil: Relatively insoluble, therefore, movement is not appreciable.

9. **Grazing, Cropping and Other Restrictions:** Do not feed treated foliage within 60 days of treatment.

0. **Toxicity:** High acute mammalian toxicity. Acute oral LD$_{50}$ (rats) = 2 - 4 mg/kg.
Acute dermal LD$_{50}$ (rabbits) = 226 mg/kg. Highly toxic to fish, birds and other animals. Birds consuming granules may be killed. Poisonous by skin contact, inhalation or swallowing. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning.

Thimet (cont'd)

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children and animals**. Pour downwind and allow as little free fall as possible.

    If in eyes or on skin, use standard first aid measures. Remove contaminated clothing and shoes. **If inhaled**, remove victim to fresh air. If victim is not breathing, give artificial respiration, preferably mouth to mouth. If breathing is difficult, give oxygen. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Weakness, headache, tightness of chest, blurred vision, non-reactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea and abdominal cramps.

    Call a physician at once in case of suspected poisoning. **In emergency** endangering life or property, call collect day or night 1-800-454-2673. **Antidote is atropine.**

    For physician: Give atropine intramuscularly or intravenously depending on severity of poisoning, 2 - 4 mg every 10 minutes until fully atropinized. 20 - 30 mg or more may be required during the first 24 hours. Never give opiates or phenothiazine tranquillizers or other depressants. Clear chest by postural drainage. Artificial respiration or oxygen administration may be necessary. Observe patient continously for at least 48 hours. Repeated exposure to cholinesterase inhibitors may, without warning, cause increasing susceptibility to very small doses of any cholinesterase inhibitor. Allow no further exposure to any cholinesterase inhibitor until cholinesterase regeneration has taken place. Pralidoxime chloride (2-PAM: Protopam chloride) may be effective as an adjunct to atropine. Use according to label directions.

    Decontamination:

    Procedure for decontamination of surfaces: Keep unprotected persons out of the contaminated area.

    Protective equipment: Hat, overalls, rubber apron, rubber boots and rubber gloves. **Do not allow** product to contact eyes and skin. Launder clothing and clean protective equipment after use.

    Warning: Avoid smoking, open flames and sparks in the operating area as the decontamination procedure involves use of alcohols. Cover spilled granules with an absorbent material such as sweeping compound to minimize dust. Sweep up granules and place in a tightly closed, labelled container. Store in a secure place. Contact Cyanamid Canada Inc. or federal authorities for details on how to detoxify product. Granules that remain in a broken bag should be transferred to a clearly marked, tightly closed alternate container. Dispose of material in accordance with provincial requirements. Wash surface with a bleach decontamination solution prepared by mixing 9 L water with 1 L commercial bleach and 0.5 L rubbing alcohol. Rinse with clean water. Clean up the liquid with absorbent material such as sawdust, sweeping compound or other materials. Repeat washing with bleach solution and water until liquid is cleaned up. Dispose of contaminated absorbent material in accordance with provincial requirements. Wash disposal equipment with bleach solution and rinse with clean water. If spill occurs on the ground, collect material and dispose as directed. Treat affected area with the decontamination solution and cover with clean soil.

12. **Storage:** Do not use or store in or around the home. Must be stored or displayed **away** from food and feed. Store open bags in labelled, sealed drums or heavy plastic bags.

Thiodan/Endosulfan/ Thionex EC *(endosulfan)*

Group 2A

Manufacturer: Bayer CropScience/United Agri Products

DANGER POISON

1. **Formulations:** Emulsifiable concentrate; 400 g/L; 10 L container. Wettable powder; 50%; 2 kg bag.
2. **Registered Mixes:** Endosulfan is compatible with most insecticides and fungicides except Bordeaux mixture, hydrated lime, calcium arsenate or zinc sulphate.

   Mixing instructions: Wettable powder: fill spray tank nearly full and either pour recommended amount on water surface or pre-mix powder in a bucket 1/2 filled with water, then pour mix through screen into nearly filled spray tank. Finish filling tank. Keep agitator running during filling and spraying.
3. **Crops:**

   alfalfa
   beans (except lima)
   canning peas
   clover
   field corn
   potatoes
   seed peas
   sugar beets
   sunflowers
   sweet corn
4. **Insects Controlled:**

   aphids
   beet webworm
   black bean aphid
   Colorado potato beetle
   corn earworm
   corn leaf aphid
   green peach aphid
   leafhoppers
   pea aphid
   pea weevil
   potato aphid
   potato flea beetle
   potato leafhopper
   spittle bug
   sunflower beetle
   tarnished plant bug
   tuber flea beetle
5. **When Used:** Repeat as necessary unless directed otherwise.

   Alfalfa, clover: Apply soon after spittle bug eggs hatch. Do not apply when bees are present.

   Corn, peas: Do not apply more than twice per season. Apply to peas only if crop is to be harvested by combine.

   Sugar beets, sunflowers: Do not apply more than once per season.

   Sunflower beetle: Economic threshold – 1 - 2 adults/seedling or 10 - 15 larvae/plant causing 25% defoliation on the upper 8 - 12 leaves.
6. **How to Apply:**

   With: Aircraft or ground equipment.

   Rate: Lower rate for young insects (larvae), light infestations or sparse foliage.

Crop	Insect	EC/WP	Quanity/ac
Alfalfa, clover	Spittle bugs	EC	0.3 L/ac
Beans (except lima)	Black bean aphid, green clover worm, Mexican bean beetle, potato leafhopper	EC	0.6 L/ac
		WP	445 - 605 g/ac
Canning peas	Pea aphid, pea weevil	EC	0.6 - 0.8 L/ac
		WP	445 - 710 g/ac
Field corn, sweet corn	Corn earworm	EC	1.1 - 1.7 L/ac
	Corn leaf aphid	EC	1.1 L/ac
Potatoes	Aphids, Colorado potato beetle, potato flea beetle, potato leafhopper, tuber flea beetle	EC	0.6 L/ac
		WP	445 g/ac
	Tarnished plant bug	EC	0.8 L/ac
		WP	605 - 710 g/ac

(continued)

Thiodan/Endosulfan/Thionex EC (cont'd)

(continued)

Crop	Insect	EC/WP	Quanity/ac
Sugar beets	Beet webworm	EC	1.1 L/ac
	Green peach aphid	EC	0.8 L/ac
Sunflower	Sunflower beetle	EC	0.6 L/ac

Water volume: Thorough wetting of all plant parts is essential for good results.

Nozzles: Flat fan recommended.

7. **Application Tips**: Apply during late evening. Spray upper and lower leaf surfaces. Prevent sprays or dusts from drifting to areas occupied by people or animals.
8. **How it Works:** A non-systemic, organochloride insecticide/acaricide with both contact and stomach action.
9. **Grazing, Cropping and Other Restrictions:** Pre-harvest intervals (days): alfalfa (30), beans (2), corn (50), clover (30), peas (7), potatoes (1), sugar beets (45), sunflower (60). Do not feed alfalfa or clover forage within 30 days of application. Do not feed treated bean threshings or crop refuse to livestock. Do not feed fresh, dry or ensiled pea vines and pea pods to any livestock or allow grazing in treated fields. Do not feed treated sugar beet foliage to livestock; however, roots may be fed. Do not feed treated sunflower foliage to livestock.

   Succeeding crops: Do not apply to crops that are to be followed by a root crop other than carrots, potatoes, sweet potatoes or sugar beets.
10. **Toxicity**: High acute mammalian toxicity. Acute oral LD_{50} (rats) = technical 80 - 110 mg/kg. Toxic to bees. Highly toxic to fish. Moderately toxic to birds and mammals. Do not contaminate streams or lakes.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Nausea, headache, general feeling of being unwell, followed by generalized convulsion.

    Decontamination:

    Spilled powder: Cover with sawdust or dirt to prevent scattering. Apply sodium carbonate, caustic soda or hydrated lime on contaminated area. After 1 hour, collect and wash paved areas with water.

    Spilled liquid: Decontaminate with any of above alkaline chemicals and allow to stand for 1 hour. Apply sawdust, talc or sand to absorb all liquid. Decontaminate tools with hydrated lime. Dispose of waste in accordance with provincial requirements.

    Notes to physician: Do not give stimulants. Epinephrine or equedrine may cause ventricular fibrillation. Use an anti-convulsant.
12. **Storage**: Do not store E.C. below -7°C.

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Chemical Control of Plant Diseases in Alberta

Introduction

Plants, like other living organisms, are attacked by many diseases that are caused by fungi, bacteria, viruses, mycoplasmas and nematodes. The management of plant diseases is based on four general parameters:

- **Exclusion** or quarantine, i.e. prevention of a disease organism or diseased plant material from entering a country or disease-free area where the disease could become established.
- **Protection** whereby proper sanitation practices, chemical controls, adequate soil nutrient levels and good soil drainage may be used to protect plants from disease organisms,
- **Eradication** involving the use of crop rotations or the application of eradicant chemicals such as fungicides.
- **Plant breeding** whereby crop plants are selected for partial or complete resistance to a specific disease or range of infectious diseases.

Chemical control of disease

In Alberta, fungal diseases of some field crops may be subject to direct chemical control by fungicides. Control of most other field crop diseases relies on alternate methods. The major use of fungicides in these crops, at present, is in the treatment of seeds (cereal, forage, oilseed) and potato seed pieces. This situation may change in the near future as grain growers move to adopt more intensive crop management strategies in an attempt to increase profit margins.

At present, foliar fungicides are registered for Sclerotinia white mold and blackleg control in canola, cereal leaf diseases, field beans, lentils and foliar diseases of potatoes. For convenience, dual purpose treatments with the insecticide lindane and diazinon, used in seed-treatment formulations, have been included in this chapter on fungicides. For principles and procedures involving the use of plant disease control chemicals, follow the information outlined in the first section of this guide.

Seed Treatment of Cereal, Forage, Oilseed and Pulse Crops

Purpose of seed treatment

Seed treatment provides economical insurance against many diseases and some insect pests of seed and seedlings. Chemical treatment can give seedlings a head start by preventing or reducing damage resulting from certain crop pests.

Diseases are controlled by contact fungicides that destroy fungi carried on the seed, such as common bunt of wheat, the surface-borne smuts of barley and oats, fungus stripe of barley, and some leaf-spotting and seed decay fungi. Systemic fungicides destroy fungi carried in the seed, such as loose smut of wheat and barley, and they protect the early growth of the seedling.

Specific recommendations:

- Rye and flax should be treated because they are very susceptible to seed decay.
- Winter wheat should be treated to prevent bunt and seed decay as well as to promote good seedling growth.
- If bunt or smut was observed in a crop that will be used for seed, the grain should be treated. If a variety is grown that is susceptible to bunt or smut and the presence of the disease is uncertain, it may be wise to treat the seed annually or every second year, depending on the susceptibility of the variety.
- Canola should always be treated to control the seed-borne phase of blackleg.
- Alfalfa seed is treated to control verticillium wilt.

Insecticidal seed treatment will prevent or reduce damage caused by certain crop pests.

- Crops on newly-broken land or cereals on fields with previous wireworm damage should be treated with an insecticide formulation. For a lasting effect, the treatment should be done over two consecutive years.
- Canola and mustard are protected against flea beetles by lindane formulations. Granular insecticides offer extended protection.

Methods of seed treatment

Custom treatment

Fungicides are applied to the seed sometime before planting. Seed cleaning plants are equipped to treat seed with liquid fungicides. Farmers can use a variety of methods for both liquid and dry formulation application.

Drill box treatment

Seed is treated directly in the drill box. Fungicides and seed are layered and then mixed thoroughly. This technique avoids the problem of storing treated seed or treating more seed than necessary for planting. Use protective gloves, clothing and breathing equipment for this operation.

Precautions

- **read** and **follow** label directions carefully
- **treated** seed must not be allowed to contaminate grain intended for food, feed or commercial use
- **bury** leftover treated seed or store it safely in labelled bags for future use as seed
- **treated** seed offered for sale must be labelled with the name of the treated chemicals (*Canada Seed Act*)
- **treated** seed in transit must be bagged or bulk loads tarped to prevent spillage (*Alberta Act*)

Fungicide Group Classification by Mode of Action

Mode of action	Chemical family	Active ingredients	Found in
Group 1			
Inhibition of tublin formation.	Benzimidazole	benomyl	Beniate 50WP, Benlate Toss-N-Go
		thiabendazole	Crown, Mertect SC
		thiophanate-methyl	DCT*, Senator 70WP, Senator PSPT
Group 2			
Affect DNA and RNA synthesis & metabolism.	Dicarboximides	iprodione	Foundation Lite, Rovral Flo, Rovral WP
		vinclozolin	Ronilan EG
Group 3			
Demethylation inhibitors.	Triazoles (includes conazoles)	difenoconazole	Dividend XL RTA, Helix*, Helix XTra*
		propiconazole	Tilt 250E, Stratego 250 EC
		tebuconazole	Raxil 250, Raxil FL
		triadimenol	Baytan 30
		triticonazole	Charter

(continued)

Fungicide Group Classification by Mode of Action

Mode of action	Chemical family	Active ingredients	Found in
Group 4			
Phenylamides. Affects RNA synthesis.	Acylamides	metalaxyl	Allegiance FL, Apron FL, Bravo, Prosper*, Ridomil Gold, Ridomil Gold MZ 68WP
		metalaxyl-M	Dividend XL RTA, Helix*, Helix XTra*
Group 5			
Morpholines inhibition of an isomerase in sterol biosynthesis.	Morpholines	dimethomorph	Acrobat MZ
Group 7			
Oxathiin. Affect mitochondrial transport chain.	Anilide (oxathiin)	boscalid	Lance
		carbathiin	Crown, Gaucho 480*, Gaucho CS FL*, Prosper*, Vitaflo 280, Vitavax Powder, Vitavax rs Fungicide, Vitavax Single Solution
Group 11			
Strobilurin type action and resistance. Inhibit mitochondrial respiration.	Strobilurin	azoxystrobin	Quadris
		cymoxanil	Curzate 60 DF
		fenamidone	Reason 500 SC
		pyraclostrobin	Headline
		trifloxystrobin	Stratego 250 EC
Group 12			
Phenylpyrroles.	Phenylpyrroles	fludioxonil	Helix*, Helix XTra*, Maxim PSP
Group 22			
		zoxamide	Gavel 75 DF
Group M			
Multi-site activity.	Chloronitrile	chlorothalonil	Bravo, Bravo 500, Ridomil Gold, Tattoo C
	Dithiocarbamates	mancozeb	Acrobat MZ, Dithane DG Rainshield NT, Gavel 75 DF, ManooPlus, Manzate 200, Penncozeb 75DF, Potato Seed Treatment, Ridomil Gold MZ 68WP, Tuberseal
		maneb	D-B Red, Dithane M-22
		metiram	Polyram 16D, Polyram DF
		thiram	Foundation Lite, Gaucho 480*, Gaucho CS FL*, Prosper*, Thiram 75WP, Vitaflo 280, Vitavax Powder, Vitavax rs Fungicide
	Inorganic	copper hydroxide	Parasol WP/FL
		sulfur	Kumulus DF
	Phthalimide	captan	Agrox B-2*, Agrox CD*, Captan Flowable, DCT*
Group U			
Unclassified	Carbamate	propamocarb-hydrochloride	Tattoo C

* Contains fungicide and insecticide combination.

Agrox B-2/Agrox CD *(diazinon + captan)*

Fungicide – Insecticide

Group 1B *(Insecticide)* **Group M** *(Fungicide)*

Manufacturer: **Norac Concepts Inc.**

DANGER POISON

1. **Formulation:**

   Seed treatment: Powders; Agrox B-2; 11% diazinon + 33.5% captan; 2 kg container. Agrox CD; 15% diazinon + 15% captan; 200 g and 600 g tube.

2. **Registered Mixes:** Use this product only on seed previously treated with captan or thiram. Do not use on seed already treated with an insecticide (other than methoxychlor or malathion).

3. **Crops:** Beans, corn, peas, soybeans.

4. **Diseases Controlled:** Captan in this formulation supplements previous fungicide treatment for seedling blight and seed rot.

   Insects controlled: Root maggots, seed maggots.

5. **When Used:** At planting time.

6. **How to Apply:**

   With: Protective equipment, using standard dry seed treatment methodology described. Agrox B-2 may be made into a slurry for application onto seed. Read label for specific mixing instructions.

   Drill box treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix product and seed thoroughly until seed is a uniform colour using the following mixing method (**Do not** mix with hands):

   1. Place and level 1/2 of the seed in drill box and sprinkle 1/2 of the required amount of product uniformly over seeds. Mix thoroughly with a paddle. Fill box with seed and sprinkle remaining 1/2 of product over seed, mix again. Thoroughly mix with a paddle when drillbox is 1/2 full and again when full.

   Rate:

Crop	Disease	Insect	Agrox B-2 ml/25 kg seed	Agrox CD ml/25 kg seed
Corn	Seed rot, seedling blight	Seed corn maggots	85	50
Beans (all)	Seed rot, seedling blight	Seed corn maggots	80	50
Peas	Seed rot, seedling blight	Seed corn maggots	80	50
Soybean	Seed rot, seedling blight	Seed corn maggots	80	50

7. **Application Tips:** Treat only the amount of seed to be sown to avoid the problem of storing treated seed.

8. **How it Works:** A protective seed treatment for the control of seedling diseases and the control of soil insects.

9. **Grazing and Harvest Restrictions:** Do not use treated seed for food, feed or oil processing.

0. **Toxicity:** Oral LD_{50} (rats) captan = 8,400 - 15,000 mg/kg, diazinon = 300 mg/kg.

1. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

   If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention. Take patient to nearest hospital, taking the labelled container with you.

   Toxicology: Diazinon may cause cholinesterase inhibition. Atropine is antidotal.

12. **Storage:** Store in cool, dry place away from food or feed. Keep container closed when not in use. Keep away from fire and sparks. Stored treated grain should be labelled: **"Do not use for food or feed. This seed has been treated with Agrox CD. Poisonous to man and animals. Keep out of reach of children."**

Apron FL/Allegiance FL

(metalaxyl)

For Commercial Seed Treaters Only

Group 4

Manufacturer: Gustafson Partnership

1. **Formulation:** Water-based liquid suspension, 317 g/L . Apron 3.78 L; Allegiance 3.78 L.
2. **Registered Mixes:** Apron FL may be applied to seed treated with Vitaflo 280, Vitavax rs Flowable or Thiram 75WP to provide a broader spectrum of disease control.
3. **Crops:** Alfalfa, barley, beans, birds-foot trefoil, canola, chickpeas, clover, field corn, forage grasses, low tannin lentils, oats, peas, rapseed, rye, sainfoin, soybeans, sugar beets, sunflowers, sweet corn, turf grasses, vetch, wheat.
4. **Diseases Controlled:** Seed rots and seedling blights caused by Pythium species. Early season Phytophthora in soybeans and downy mildew in corn, peas, sunflower.
5. **When Used:** Apply as a seed treatment prior to planting. Apron FL is sold only to commercial seed treaters who can comply with regulations pertaining to colouration of treated seed enforced under the *Seeds Act*.
6. **How to Apply:**

With: Accurate seed treating equipment. Consult Gustafson for information on seed treating equipment, calibration and use of colourants. Seed quality should be checked before committing a seed lot to chemical treatment. Avoid treating mechanically-damaged seed.

Rate: Apron FL should be mixed with water to form a slurry seed treatment.

Crop	Apron FL/ Allegiance FL mL/100 kg seed	Water mL	Total volume mL
Alfalfa, beans, clover, field corn, sainfoin, sweet corn, vetch	46 - 110	454 - 390	500
Canola, processing peas, rapeseed	32 - 110	484 - 390	500
Chickpeas, dry peas	16 - 110	484 - 390	500
Forage grasses, soybeans	46 - 93	454 - 407	500
Low tannin lentils	16	484	500
Sugar beets, turf grasses	93	407	500
Sunflowers	110 - 189*	390 - 311	500

* High rate needed for downy mildew control.

Note: A suitable seed colourant such as Gustafson Pro-Ized Seed Colourant must be added to the slurry prior to application on seed. Follow instructions on the colourant package for mixing with the Apron FL slurry.

7. **Application Tips:** Use only recommended rates.
8. **How it Works:** Metalaxyl is a systemic fungicide that is absorbed into the germinating seed and is transported through the growing seedling, providing control of seed and seedling diseases.
9. **Grazing and Harvest Restrictions:** Do not graze or feed livestock on crops grown from treated seed for four weeks after planting.
10. **Toxicity:** Low mammalian toxicity value. Acute oral LD_{50} (rats) product = 2,900 mg/kg. Mild skin irritant.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
    If swallowed, seek medical attention.
12. **Storage:** Store product in original container only, away from other pesticides, fertilizer, food or feed. Keep container closed.
13. **Resistance Management:** Apron FL/Allegience FL fungicide contains a Group 4 fungicide. Any fungal population may contain individuals naturally resistant to Apron FL/Allegience FL fungicide and other Group 4 fungicides. A gradual or total loss of pest control may occur over time if these fungicides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

Baytan 30 *(triadimenol)*

For Commercial Seed Treaters Only

Group 3

Manufacturer: Gustafson Partnership

1. **Formulation:** Water-based liquid suspension, 3.78 L package.
2. **Registered Mixes:** Baytan 30 may be applied to seed previously treated with Vitaflo 280.
3. **Crops:** Barley, wheat.
4. **Diseases Controlled:**

    Barley: Covered smut, false loose smut, leaf stripe, true loose smut and suppresses common root rot, net blotch, scald.

    Wheat: Controls powdery mildew, stinking smut (common bunt), true loose smut and suppresses take-all.
5. **When Used:** Apply as a seed treatment prior to planting. Baytan 30 is sold only to commercial seed treaters who can comply with regulations pertaining to colouration of treated seed enforced under the *Seeds Act*.
6. **How to Apply:** Baytan 30 will only be applied by certified commercial applicators. Consultation with a Gustafson technical representative is recommended for information on seed treating equipment and calibration, use of colourants and premixing with Vitaflo 280.

Baytan 30 (cont'd)

Rate:

Crop treated	Baytan 30 mL/100 kg seed	Water added mL	Slurry application rate
Barley, spring wheat	50	200 - 450	250 - 500 mL
Winter wheat	100	150 - 400	250 - 500 mL

Note: A suitable seed colourant such as Gustafson Pro-Ized Seed Colourant must be added to the slurry prior to application on seed. Follow instructions on the colourant package for mixing with the Baytan 30 slurry. The addition of a seed colourant is not required when applying Baytan 30 to seed already treated with Vitaflo 280. The seed will already be sufficiently coloured from the application of Vitaflo 280.

7. **Application Tips:**
    1. Certified commercial applicators are advised to consult with the manufacturer regarding special application procedures.
    2. Baytan treated seed should not be planted at depths exceeding 4 cm.
    3. Do not apply Baytan to mechanically damaged seed or to seed lots of unknown or poor quality.
8. **How it Works:** Triadimenol is a systemic fungicide that is absorbed into the germinating seed and transported through the growing seedling, providing control of seed and seedling diseases.
9. **Grazing and Harvest Restrictions:** Do not graze or feed livestock on crops grown from treated seed for 40 days after planting.
10. **Toxicity:** Low mammalian toxicity value. Acute oral LD_{50} (rats) product = 3,300 mg/kg. Moderate skin irritant.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
    If inhaled, remove victim to fresh air. If breathing has ceased, clear airway and begin artificial respiration. If victim has difficulty breathing, give oxygen. Contact a physician or Poison Control Centre.
    If swallowed, seek medical attention. Administer water freely and induce vomiting by giving one dose (15 mL) of syrup of ipecac. If vomiting does not occur within 10 - 20 minutes, administer a second dose. If syrup of ipecac is not available, induce vomiting by sticking finger down throat. Repeat until vomit fluid is clear. Never give anything by mouth to an unconscious person. Contact a physician or Poison Control Centre.
12. **Storage:** Store product in original container only, away from other pesticides, fertilizer, food or feed. Keep container closed.

Captan Flowable *(captan)*

Group M

Manufacturer: **Norac Concepts Inc.**

1. **Formulation:** Flowable; Captan 30% methoxychlor 3% liquid suspension; 20 L container.
2. **Registered Mixes:** None.
3. **Crops:** Dry beans, field corn, lima beans, peas, snap beans, soybeans, sugar beets, sweet corn.
4. **Diseases Controlled:** Damping off, root rot, seed decay, seedling blight.

5. **When Used:** A seed treatment in the slurry method applied prior to seeding.
6. **How to Apply:**

With: Protective equipment, using standard seed treatment methodology described.

Slurry method: Apply in slurry treater equipment with the amount of water required. Seed treated by this method should be dried before bagging.

Rate:

Crop	Disease	30% Captan FL mL/25 kg seed
Bean, pea, soybean	Damping off, root rot, seed decay, seedling blight	70
Field corn	Damping off, root rot, seed decay, seedling blight	30 - 50
Sugar beet	Damping off, root rot, seed decay, seedling blight	155
Sweet corn	Damping off, root rot, seed decay, seedling blight	60 - 85

* This rate is to be applied only by a professional applicator to ensure complete and uniform coverage.

7. **Application Tips:** None.
8. **How it Works:** A protective seed treatment for the control of seed and seedling diseases.
9. **Grazing and Harvest Restrictions:** Do not feed treated seed to livestock. Do not expose treated seed to birds and other wildlife.
10. **Toxicity:** Low mammalian toxicity. Captain LD_{50} (rats) = 8,400 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
If swallowed, seek medical attention. Take labelled container with you.

12. **Storage:** In cool, dry place away from flammable materials and sources of heat and flame and away from foodstuffs. Stored, treated grain should be labelled: **"Do not use for food or feed. This seed has been treated with captan."**

Charter *(triticonazole)*

Group 3

Manufacturer: **BASF Canada**

CAUTION POISON

1. **Formulation:** 25g/L triticonazole FS.
2. **Registered Mixes:** None.
3. **Crops:** Barley, oats, wheat.
4. **Diseases Controlled:**

Barley: Covered smut, false loose smut, loose smut, seed rot (*Fusarium* spp.), seedling blight (seed- and soil-borne *Fusarium* spp.), suppression of Fusarium crown and root rot.

Oats: Covered smut, loose smut.

Wheat: Common smut, loose smut, seed rot (*Fusarium* spp.), seedling blight (seed- and soil-borne *Fusarium* spp.), suppression of Fusarium crown and root rot.

Charter (cont'd)

5. **When Used:** Seed treatment.
6. **How to Apply:** Seed should be well conditioned and cleaned before treating with Charter. Treated seed should not require drying after treatment and can be stored or bagged immediately. Uniform seed coverage is required for good disease control. To ensure adequate seed coverage, add Charter to seed slowly in a calibrated treating equipment system to ensure proper rates. Thoroughly mix the recommended amount of Charter into the required amount of water for the treated seed, and follow manufacturer's instructions for the seed treating equipment being used.

Rate:

100 mL concentrate/100 kg seed (300 mL diluted product/100 kg seed).

Mixing instructions: When using 100 mL/100 kg seed, Charter must be diluted with water to provide adequate application volume to ensure good coverage of seed and mix thoroughly. For best results add 2 parts water with 1 part Charter while adding sufficient dye to ensure optimal seed colouration.

	Bushels treated		
Container size	Barley*	Oats**	Wheat***
3.1 L jug of concentrate	142	201	114
66.7 L drum of concentrate	3,064	4,325	2,451

* Based on 48 lbs/bu
** Based on 34 lbs/bu
*** Based on 60 lbs/bu

Important: Recommended dilution is 2 parts water plus one part concentrate.

7. **Application Tips:** Uniform coverage is important to obtain optimum disease control.
8. **How it Works:** Charter is a systemic seed treatment that controls certain seed-borne diseases.
9. **Grazing and Harvest Restrictions:** Do not use treated seed for food, feed or oil processing. Do not feed treated seed, or otherwise expose, to wildlife or domestic birds.

10 **Toxicity:** Acute oral = >5,000 mg/kg rats, Acute dermal = >2,000 mg/kg rabbits. Tested as mildly irritating to the eye. Tested as slightly irritating to the skin (rabbits). Do not feed treated seed or otherwise expose wildlife or domestic birds. If treated seed is spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion. **Do not** contaminate domestic or irrigation water supplies, lakes, streams, ponds or any other body of water.

11. **Precautions, First Aid:** Avoid contact with skin and eyes. Harmful if inhaled. Avoid inhaling or breathing dust. Wear chemical resistant gloves and chemical resistant coveralls when handling Charter or treated seed. When handling Charter and when treating seed or while auguring or handling treated seed, work in a well ventilated area. Wear a NIOSH-approved dust filtering respirator during cleanup activities or if working area is not well ventilated. Wash hands and exposed skin thoroughly after handling the concentrate and after application. **Keep out of reach of children**.

    Remove person from contaminated area; remove contaminated clothing. Keep patient warm, comfortable and at rest. **If in eyes**, irrigate with water for 20 minutes. Get medical attention. **If on skin**, wash exposed skin with soap and cold water. **If inhaled**, if breathing stops, start artificial respiration. **If swallowed**, if patient is conscious, wash out mouth. Induce vomiting by touching the back of the throat with finger or blunt object. **Do not give milk or oils**. Get medical attention.

12. **Storage:** Protect from frost and freezing. Do not store Charter seed treatment fungicide near feed or foodstuffs.
13. **Resistance Management:** For resistance management, note that Charter seed treatment fungicide contains a Group 3 fungicide. Some loss of disease control may occur over time if triticonazole or other Group 3 fungicides in this group are used repeatedly or consecutively in successive years on the same fields, due to development of resistant strains of pathogens. It is recommended that fungicides with a different mode of action be alternated in the disease control program.

Crown *(carbathiin + thiabendazole)*

Group 7,1

Manufacturer: **Gustafson Partnership**

1. **Formulation:** 10 L jug; 92 g/L carbathiin + 58 g/L thiabendazole, 10 L jug.
2. **Registered Mixes:** None.
3. **Crops:** Chickpeas, lentils.
4. **Diseases Controlled:** Chickpeas: Seed-borne Ascochyta (*Ascochyta rabili*). Lentils: Seed-borne Ascochyta (*Ascochyta lentis*), seedling blight, seed rot.
5. **When Used:** Pre-seeding or drill box treatment.
6. **How to Apply:**

   With: Protective equipment, using standard dry seed treatment methodology described. Seed-dressing equipment for liquid formulations. Clean planter plates periodically to prevent excessive chemical powder build-up.

   Pre-seeding treatment: Crown can be applied in a continuous treating operation with S-Series Treaters or OFT Treaters, batch treaters or cement mixers.

   Rate: Chickpeas: 75 - 150 mL/25 kg. Lentils: 150 mL/25 kg.
7. **Application Tips:** It is important that the seed and chemical are mixed quickly and uniformly. Crown's liquid properties enable this product to act as a sticker for innoculants. The product is SAFE to the nitrogen fixing bacterium found in peat and granular innoculants.
8. **How it Works:** Thiabendazole, a fungicide, controls seed-borne diseases. Carbathiin, a systemic fungicide, penetrates the seed coat to control diseases of the seed and seedling. Controls the diseases listed.
9. **Grazing and Harvest Restrictions:** Do not use treated seed for feed, food or oil processing. Do not leave treated seed exposed to birds or animals.
10. **Toxicity:** Acute oral LD_{50} (rats) carbathiin = 3,820 mg/kg; thiabendazole = 3,300 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots and rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning Clothing and Equipment* (see page 29) before reuse. Get medical attention immediately for eyes. **Keep out of reach of children**.

    If in eyes, flush immediately with running water. **If on skin**, wash with warm water and soap.
    If swallowed, seek medical attention immediately.

    Symptoms of poisoning: Skin contact with fungicides may result in irritation and dermatitis.
12. **Storage:** Do not store in or around the home. Do not store Crown at temperatures below 0°C or exceeding 35°C. Label stored, treated seed with: **"Do not use for food, feed or oil-processing. This seed has been treated with carbathiin + thiabendazole. Poisonous to man and animals. Keep out of reach of children."**

D-B Red *(maneb)*

Group M

Manufacturer: **United Agri Products**

WARNING POISON

1. **Formulations:** 323 g/l liquid.
2. **Registered Mixes:** Compatible with most insecticides and fungicides but not with Bordeaux mixture or lime.
3. **Crops:** Barley, oats, rye and wheat.
4. **Diseases Controlled:** Bunt, covered smut, false loose smut, root rot, seed borne seedling blight.
5. **When Used:**

   Pre-seeding or drill box treatment: Treat seed before sowing. Seed should be well cured, dry and cleaned before treatment. Do not store treated grain more than 1 year.

   Potatoes: Apply early (when plants are 15 cm high) and treat at 7 - 10 day intervals throughout the season. Shorten interval to 5 - 7 days when weather favours disease.

6. **How to Apply:**

   With: Protective equipment, using standard dry seed treatment methodology described.

   Pre-seeding treatment: Apply with any standard dry seed treatment application equipment or the shovel method.

   Drill box treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix product and seed thoroughly until seed is a uniform colour by the following alternate mixing methods (Do **not** mix with hands):

   1. Place and level 1/2 of the seed in drill box and sprinkle 1/2 of the required amount of product uniformly over seed. Mix thoroughly with a paddle. Fill box with seed and sprinkle remaining 1/2 of product over seed, mix again, **or**
   2. Dribble the required amount of product into seed as it is poured into drill box. Thoroughly mix with a paddle when drill box is 1/2 full and again when full, **or**
   3. Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.

   Water volume: Foliar spray: Potatoes: 325 - 405 L/ac; Heavy vines: 405 - 610 L/ac.

   Rate:

Crop	Disease	D-B Red ml/25 kg seed
Barley	Covered smut, false loose smut, root rot, seed-borne seedling blight	99
Flax	Damping off, seedling blight	–
Oats	Covered smut, loose smut, root rot, seed-borne seedling blight	138
Rye	Bunt, root rot, seed-borne seedling blight	65
Wheat	Bunt, root rot, seed-borne seedling blight	78

7. **Application Tips:** Treat only the amount of seed to be sown to avoid the problem of storing treated seed. Slurry treatment not recommended for flax. Calibrate treater prior to treating seed. Use only recommended rates. Lower amounts may not give the desired control. Excessive amounts may cause seed injury.
8. **How it Works:** D-B Red is a protective seed treatment fungicide.
9. **Grazing and Harvest Restrictions:** Pre-harvest interval (days): Potatoes (1). Do not feed treated seed to livestock. Do not expose treated seed to birds and other wildlife.

10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) maneb = 6,750 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention. Take patient to nearest hospital, taking the labelled container with you.
12. **Storage:** Store product in a cool, dry place away from food or feed. Prevent the contents from becoming wet as this will reduce effectiveness and may cause flammable vapours. Keep away from fire and sparks. Stored, treated grain should be labelled: **"Do not use for food or feed. This seed has been treated with maneb. Poisonous to man and animals. Keep out of reach of children."**
13. **Resistance Management:** D-B Red is a group M fungicide. Any fungal population may contain individuals naturally resistant to D-B Red and other group M fungicides. A gradual or total lost of pest of control may occur over time if these fungicides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

DCT *(diazinon + captan + thiophanate methyl)*

Fungicide – Insecticide

Group 1B *(Insecticide)* **Group M,1** *(Fungicide)*

Manufacturer: **Norac Concepts Inc.**

1. **Formulation:** Wettable powder contains diazinon 6% + captan 18% + thiophanate-methyl 14%. 10 kg and 400 g.
2. **Registered Mixes:** None.
3. **Crops:** Common dry beans, sweet corn.
4. **Diseases Controlled:** Common dry beans: Seedling blight and root rot, seed-borne Anthracnose. Sweet corn: Seed-borne *Penicillium oxalicum*, *Penicillium* spp.

    Insects controlled: Root maggots.
5. **When Used:** As a seed treatment at planting time.
6. **How to Apply:**

    Common dry beans – slurry machines: Use 520 g seed treatment per litre of water and apply 1 L of slurry per 100 kg of seed. For other rates of slurry application, adjust to maintain 130 g of seed treatment per 25 kg of seed. Hand mixing: For each 25 kg of seed, use 130 g in 350 mL of water. Mix well to keep powder suspended in water. Pour mixture over the seed, and mix with a paddle or shovel until seed is coated evenly. Dry the seed before seeding or bagging.

    Sweet corn – as a seed box treatment: Apply 125 g of DCT to 25 kg of seed. When starting with an empty planter, place enough treated seed in the planter box to cover the bottom. Treat this seed in a separate container that can be destroyed later. Add the remaining seed to the planter box, and treat by stirring thoroughly with a paddle or lath so that the seed is coated with the seed treatment.
7. **Application Tips:** See *"How to Apply."*
8. **How it Works:** DCT is a protective seed treatment for the control of seedling diseases and soil insects.
9. **Grazing and Harvest Restrictions:** Do not use treated seed for food, feed or oil processing.

DCT (cont'd)

10. **Toxicity:** Diazinon may cause cholinesterase inhibition. If poisoning occurs, get prompt medical aid. Atropine is antidotal.
11. **Precautions, First Aid:** May be fatal if swallowed. Never handle material with bare hands. Use rubber gloves; do not use leather or cloth gloves. Avoid spilling on skin or clothing. Do not breathe dust. When treating, auguring or handling treated seed, work in a well ventilated area, and wear a respirator, goggles and gloves. When handling or applying, wear a respirator, goggles and clothing that completely covers arms and legs to minimize exposure. Change contaminated clothing daily, and wash thoroughly before reuse. Wash hands, face and arms thoroughly after handling this product and before drinking, eating or smoking. Shower after use or at the end of workday. Wash clothing and gloves before reuse. Always work out of the wind during mixing and loading operations. Keep unprotected persons out of the operating area or vicinity where there may be drift. Do not contaminate food or feed. Do not contaminate any body of water. If an accident occurs, remove contaminated clothing and wash skin thoroughly with soap and water. **Keep out of reach of children**.

    In case of poisoning, call a physician or Poison Control Centre immediately. **If on skin**, remove contaminated clothing and wash skin thoroughly with soap and water. **If in eyes**, flush with water for 5 - 10 minutes and obtain medical attention. **If swallowed**, give the patient one to two glasses of water and cause vomiting by giving one dose of syrup of ipecac. If the patient does not vomit within 20 minutes, give a second dose. If syrup of ipecac is not available, give the patient one to two glasses of water and cause vomiting by inserting a finger down the throat. Repeat with water until vomit fluid is clear. The patient should be lying down with the head below the level of the feet. Do not try to cause vomiting if the patient is unconscious or in a convulsive state.
12. **Storage:** Store in cool, dry place away from food or feed. Keep containers closed when not in use. Treated seed should be coloured and labelled: **"Poisonous to humans and animals. This seed has been treated with Diazinon, Captan and thiophanate-methyl for control of insects and seed-borne diseases. Do not use for food or feed purposes."**

Dividend XL RTA

(difenoconazole + metalaxyl-M)

Group 3,4

Manufacturer: Syngenta Crop Protection Canada Inc.

WARNING POISON

1. **Formulation:** 3.48% FS; 3.37% difenoconazole + 0.27% metalaxyl-M; 2 x 10 L jugs, 115 x 450 returnable totes.
2. **Registered Mixes:** None.
3. **Crops:** Barley, durum wheat, spring wheat and winter wheat varieties.
4. **Diseases Controlled:** Dwarf bunt, loose smut, seed- and soil-borne common bunt, seed- and soil-borne Fusarium, seed-borne Septoria, general seed rots (caused by Saprophytic fungi such as *Penicillium* and *Aspergillus*), Pythium damping off, early season control of Septoria leaf blotch.

    Fungi suppressed: Common root rot (*Cochliobolus* spp.) and take-all, Fusarium crown and root rot.
5. **When Used:** Treat seed prior to or at seeding.
6. **How to Apply:**

    With: Dividend XL RTA can be applied on farm or commercially. Dividend XL RTA may be applied to seed with any standard gravity flow or mist-type seed treatment equipment that accurately meters and mixes a flowable seed treatment. Dividend XL RTA may also be used with treat-on-the-go air seeders. The application equipment used must provide uniform coverage of Dividend XL RTA on the seed. Uneven seed coverage may not give the desired level of disease control.

Rate:

Crop	Disease	mL/100 kg seed
Barley	Common root rot, covered smut, false loose smut, Fusarium crown and root rot, Pythium damping off, seed rot, seed-borne Fusarium	325
	All of the above diseases plus seed-borne Septoria	650
Durum wheat, spring wheat	Common bunt, general seed rot, loose bunt, Pythium damping off, seedling blight caused by seed- and soil-borne Fusarium	325
	Suppression of common root rot (*Cochliobolus* spp.), Fusarium crown and root rot, take-all	
	All of the above diseases plus seed-borne Septoria	650
Winter wheat	Common bunt, dwarf bunt, general seed rots, loose smut, Pythium damping off,seedling blight caused by seed- and soil-borne Fusarium	325
	Suppression of common root rot (*Cochliobolus* spp.), Fusarium crown and root rot, take-all	
	All of the above diseases plus Septoria leaf blotch	650

Note: One 10 L jug of Dividend XL RTA applied at the 325 mL/100 kg seed rate will treat 112 bushels of wheat, and 140 bushels of barley.

7. **Application Tips:** Uniform coverage is important to obtain optimum results in the field.
8. **How it Works:** Dividend XL RTA is a systemic seed treatment, which controls or suppresses certain seed- and soil-borne diseases of barley and wheat.
9. **Grazing and Harvest Restrictions:** Do not graze, feed green forage or cut for hay within 55 days of planting. Do not plant any crop other than wheat within 30 days to fields in which treated seeds were planted.
10. **Toxicity:** Practically non-toxic acute mammalian toxicity. Acute oral LD_{50} (rats) = 5,050 mg/kg. Toxic to fish and other aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. If treated seed is spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.
11. **Precautions, First Aid:** When handling Dividend XL RTA, contaminated equipment or seed treated with Dividend XL RTA, wear long pants, a long-sleeved shirt and chemical resistant gloves. Harmful if swallowed. Avoid contact with eyes or prolonged contact with skin. Avoid inhalation of vapours or spray mist. Wash hands and face after handling and before eating or smoking. Wear a suitable dust mask when transferring seed to a storage bin. **Keep out of the reach of children**.

    If in eyes, immediately rinse eyes with plenty of water for 15 minutes. Hold eyelids apart to rinse the entire surface of the eyes and lids. Obtain medical attention or contact a Poison Control Centre. **If on skin**, wash thoroughly with soap and water. Remove contaminated clothing and wash prior to reuse. If irritation occurs, obtain medical attention or contact a Poison Control Centre. **If inhaled**, move patient to fresh air. Apply artificial respiration if necessary. **If swallowed**, repeatedly administer medicinal charcoal in a large volume of water. Never give anything by mouth to an unconscious person. Do not induce vomiting. Obtain prompt medical attention or contact a Poison Control Centre.
12. **Storage:** Keep product in heated storage prior to use.

Foundation Lite *(iprodione + thiram)*

Group 2,M

DANGER POISON

Manufacturer: **Bayer CropScience**

1. **Formulation:** Liquid; 132 g/L iprodione + 88 g/L thiram; 100 L, 200 L or 1,000 L containers.
2. **Registered Mixes:** Counter 5G only.
3. **Crops:** Canola, mustard.
4. **Diseases Controlled:** Alternaria black spot and seed-borne blackleg on emerging seedlings, damping off rot caused by *Rhizoctonia solani*.
5. **When Used:** Treat seed once before seeding. Do not store treated seed for more than 6 months. Treated seed stored for more than 6 months should be tested for germination before planting.
6. **How to Apply:** Stir well before using. 100 L container treats 4,444 kg of seed; 200 L treats 8,888 kg of seed; 1,000 L treats 44,444 kg of seed.

   Rate:

Crop	Disease	Insect	Foundation Lite mL/25 kg seed
Canola, mustard	Alternaria, blackleg, rhizoctonia	Flea beetles	563 mL

7. **Application Tips:** Roll drum or stir well before using. Thorough seed coverage is required. Treated seed should not require drying after treatment and can be stored or bagged immediately. Treat only the required amount of seed.
8. **How it Works:** Iprodione fungicide protects against seed-borne blackleg, Alternaria and seedling blight caused by *Rhizoctonia solani*. Thiram fungicide protects against soil-borne pathogens. Prevents the above-mentioned diseases from developing and protects against flea beetles for a few days after seedling emergence.
9. **Grazing and Harvest Restrictions:** Do not leave treated seed exposed to birds or other animals.
10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = 200 - 400 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
    If swallowed, seek medical attention. When treating seed or while augering or handling treated seed, work in a well ventilated area and wear a suitable respirator. Wash hands and exposed skin thoroughly after handling the concentrate and after application.
12. **Storage:** Do not store in the home or near food or feed. Protect from freezing.

Manzate 200/MancoPlus/ Tuberseal/Potato Seed Treatment *(mancozeb)*

Group M

Manufacturer: **Dow AgroSciences Canada/DuPont Canada/Norac Concepts/United Agri Products**

1. **Formulation:** Dispersible granule; Manzate 200; 80%; 2.5 kg, 20 kg bags. Dust; MancoPlus; Tuberseal; 16%; 10 kg bags. Potato Seed Treatment; 80%, 20 kg bag.
2. **Registered Mixes:** A dust may be prepared by diluting and thoroughly mixing Manzate 200 with prophylite or other neutral diluent; commonly used insecticides may displace an equivalent amount of diluent. Use dust mixtures as soon as possible after preparation. A spreader-sticker may be added to Manzate 200 in spray preparations.
3. **Crops:** Alfalfa seed, corn, potatoes.
4. **Diseases Controlled:** Fusarium decay (potato), root rot (corn).
5. **When Used:** Potato seed pieces and corn seed: treat before planting.
6. **How to Apply:**

   With: Potato seed duster, protective equipment, using standard seed treatment methodology described.

   Rate:

Crop	Disease	Formulation	Quantity
Seed treatments			
Corn seed	Root rot, seedling blight	Manzate 200	0.22 kg/100 kg seed
Potato seed pieces	Fusarium decay	Tuberseal Potato Seed Treatment	0.5 kg/100 kg seed

7. **Application Tips:**

   Corn seed: Apply as dust or slurry. Treated seed should not be stored.

   Potato seed pieces: Thoroughly coat the surface of whole or cut potato pieces. If treated whole seed is cut, make a second application. Plant as soon as possible after treating. If planting is delayed beyond 2 days after treating, seed should be air dried before bagging or loose piling.
8. **How it Works:** A protective seed-treatment fungicide that controls Fusarium decay. A contact fungicide.
9. **Grazing and Harvest Restrictions:**
10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) mancozeb = 11,200 mg/kg. Prolonged exposure may cause eye, nose, throat and skin irritation.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
    If swallowed, seek medical attention.
12. **Storage:** Store in a cool, dry, ventilated place away from fire and sparks. Do not allow product to become wet or overheated during storage as chemical changes may reduce fungicidal effectiveness and flammable vapours may be generated. Treated seed should be labelled: **"Do not use for food or feed. This seed has been treated with mancozeb. Poisonous to man and animals. Keep out of reach of children."**

Maxim PSP *(fludioxonil)*

Group 12

Manufacturer: **Syngenta Crop Protection Canada Inc.**

1. **Formulation:** Dust 0.5% fludioxonil formulated as a dry powder seed piece treatment. 10 kg bag.
2. **Registered Mixes:** None.
3. **Crops:** Beans, cereals, corn, field peas, grasses, oilseeds, potatoes.
4. **Diseases Controlled:** Black scurf including stem and stolon canker (*Rhizoctonia solani*), Fusarium dry rot (*Fusarium* spp.) and silver scurf (*Helminthosporium solani*).
5. **When Used:** Maxim PSP is a preplant seed piece treatment. Cut pieces should be treated immediately after cutting. If treated seed pieces are to be bagged, they should be stored for 2 - 3 days in open crates before bagging. For optimum protection against silver scurf, ensure that seed tubers are completely free of soil. Total skin coverage is essential.
6. **How to Apply:**

   With: Apply using appropriate seed piece treater designed for treating potatoes.

   Rate: 500 g/100 kg seed.
7. **Application Tips:** For optimum protection against disease, ensure that seed pieces are completely free of soil. Complete coverage of the seed piece with Maxim PSP is essential.
8. **How it Works:** Fludioxonil is phenylpyrrole chemistry derived and synthesized from exudates of the soil bacterium *Pseudomonas* and possesses contact and local penetrant properties.
9. **Grazing and Harvest Restrictions:** Do not feed or allow livestock to graze on treated crops.
10. **Toxicity:** Practically non-toxic, acute toxicity acute oral LD_{50} (rats) = >5,000 mg/kg. Toxic to aquatic invertebrates and fish. Do not contaminate domestic or irrigation water supplies, lakes, streams and ponds.
11. **Precautions, First Aid:** During treatment, wear two layers of clothing (e.g. coveralls over a full-length undergarment, a dust mask and work boots). In addition, wear chemical-resistant gloves when handling Maxim PSP and when handling treated seed. May be harmful if swallowed. Avoid inhalation of dust. Wash hands and face after handling. **Keep out of reach of children**.

    If in eyes, rinse with lots of water for 15 minutes. Hold eyelids apart to rinse the entire surface of the eye and lids. Do not apply any medicating agents except on the advice of a physician. **If on skin**, remove contaminated clothing and thoroughly wash the affected part of the body with soap and water. **If inhaled**, remove person to fresh air. Apply artificial respiration if necessary. **If swallowed**, give victim 1 - 2 glasses of water if conscious and induce vomiting. Never give anything by mouth to an unconscious person. Take person to the nearest hospital.
12. **Storage:** Store in a dry place.
13. **Resistance Management:** Maxim PSP contains fludioxonil. Any fungal population may contain individuals naturally resistant to fludioxonil or strains of some fungi may develop tolerance to fungicides after prolonged usage. It is important to follow label rate and directions and to observe all practices that minimize the occurrence of resistance. Whenever possible, alternate with products from different chemical families. In order to minimize the potential for the development of resistance among the labelled disease organisms, do not use Maxim PSP in any two consecutive seed generations.

Mertect SC *(thiabendazole)*

Group 1

Manufacturer: **Syngenta Crop Protection Canada Inc.**

1. **Formulation:** Suspension; 500 g/L; 4 x 5 L pack.
2. **Registered Mixes:** Consult with manufacturer before mixing with other chemicals.
3. **Crops:** Potatoes (tubers).
4. **Diseases Controlled:** *Fusarium* spp., *Helminthosporium* spp., *Oospora* spp., *Phoma* spp., *Rhizoctonia* spp.
5. **When Used:** Once per season.

   Potatoes: Post-harvest control of storage rot in whole potatoes.
6. **How to Apply:**

   Water volume: 7.5 L Mertect/170 L of water. 2 L of this suspension treats 1 metric tonne.

   Potatoes (storage rot): 7.5 L Mertect/170 L water.

   Rate:

Crop	Disease	Quanity
Potatoes	Storage rot	7.5 L of Mertect/170 L of water 2 L of this suspension treats 1,000 kg of potato tubers

7. **Application Tips:** Do not allow suspension to stand without continuous agitation. Potatoes must rotate along the conveyor line to ensure complete coverage. Prior to treating potatoes destined for export, confirm with the proper authorities that treated potatoes will be allowed entry into the importing country.
8. **How it Works:** Thiabendazole belongs to the benzimidazole family of fungicides. It has systemic activity.
9. **Grazing and Harvest Restrictions:** None.
10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) thiabendazole = 3,300 mg/kg. May cause skin irritation.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes. **If swallowed**, seek medical attention. Product contains petroleum distillates.
12. **Storage:** Minimum storage temperature 0°C.
13. **Resistance Management:** Mertect SC fungicide contains a Group 1 fungicide. Any fungal population may contain individuals naturally resistant to Mertect SC fungicide and other Group 1 fungicides. A gradual or total loss of pest control may occur over time if these fungicides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

Polyram 16D *(metiram)*

Group M

Manufacturer: **BASF Canada**

WARNING CORROSIVE

1. **Formulation:** Dry flowable: Polyram 16D – 16%; 10 kg box. Polyram 16D is generally used on potato seed treatment.
2. **Registered Mixes:** Benlate 50W, Diazinon, Malathion. Compatible with most commonly used insecticides, adjuvants and fungicides, including Superior Oil Mixtures with Diazinon or Malathion. These should be prepared immediately prior to use and not allowed to stand in the tank. Open bags should be sealed if stored until the following season.
3. **Crops:** Potatoes.
4. **Diseases Controlled:** Fusarium seed piece decay (potatoes), seed-borne common scab (potatoes).
5. **When Used:** See *"How to Apply."*
6. **How to Apply:**

   With: Potato seed duster.

   Rate:

Crop/disease	Formulation	Quantity/when to use
Potato seed pieces		
Fusarium seed piece decay, seed-borne common scab	Polyram 16D	0.45 - 0.65 kg/100 kg seed. Apply to entire surface of seed pieces after cutting. If not planted immediately, provide sufficient ventilation to allow the cut surfaces to dry. May be applied to uncut seed pieces at the same rate of control of seed-borne common scab. If treated whole seed is cut after treatment, a second application is needed to control Fusarium seed piece decay and black leg.

7. **Application Tips:** See *"How to Apply."*
8. **How it Works:** A contact and protectant fungicide.
9. **Grazing and Harvest Restrictions:**
10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) technical = >10,000 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
    If swallowed, seek medical attention.
12. **Storage:** Store in a cool, dry, ventilated place. Do not allow product to become wet or overheated as this will reduce its effectiveness and may create flammable vapours.

Raxil FL/Raxil 250 *(tebuconazole)*

Group 3

Mánufacter: **Gustafson Partnership**

DANGER CORROSIVE

1. **Formulations**: Flowable 6.0 g/L; Raxil 250 g/L. Container size: 2 x 10 L, 200 L.
2. **Registered Mixes**: None.
3. **Crops:** Barley, oats, wheat.
4. **Diseases Controlled: Barley:** Barley leaf stripe, covered smut, false loose smut, seed rot and seedling blight caused by Fusarium, true loose smut. **Oats:** Loose smut. **Wheat:** Common bunt (stinking smut), loose smut, seed rot and seedling blight caused by Fusarium. Suppression of common root rot caused by *Cochliobolus sativus.*
5. **When Used**: A ready-to-apply water based seed treatment formulation for commercial treaters and on farm auger treating. Chemical is added directly to the seed as it enters the mixing chamber or auger. Seed may be planted immediately or can be stored.
6. **How to Apply**:

   With: On farm treatment: through an auger with atomizing equipment or with an pump or dripolator device; can also be used with treat-on-the-go air seeders or commercially treated at seed plant.

   Water volume: Water base formulation can be diluted with water.

   Rate:

Crop	Disease	Raxil FL mL/25 kg seed	Raxil 250 mL/25 kg seed
Barley	Barley leaf stripe, covered smut, false loose smut, seed rot and seedling blight caused by Fusarium, true loose smut	45 - 60	63 - 83
Oats	Loose smut	60	83
Wheat	Common bunt (stinking smut), loose smut, seed rot and seedling blight caused by Fusarium	45 - 60	63 - 83
	Suppression of common root rot caused by *Cochliobolus sativus*		

7. **Application Tips**: Uniform coverage is important for optimum disease control.
8. **How it Works**: Tebuconazole is a systemic fungicide that is absorbed into the germinating seed and transported through the growing seedling, providing control of seed and seedling diseases.
9. **Grazing and Harvesting Restrictions**: Do not graze or feed livestock on crops grown from treated seed for 4 weeks after planting.
10. **Toxicity:** Very low mammalian toxicity value. Acute oral LD_{50} (rats) = 5,000 mg/kg. Dermal = >2,000 mg/kg.
11. **Precautions, First Aid**: Do not reuse container for any purpose. Work in a well ventilated area when treating seed or while augering or handling treated seed. Augers used for handling treated seed should not be used to move seed for feed, food or oil processing. Do not reuse bags from treated seed to handle food or feed products. Do not contaminate feed or foodstuffs with treated seed. **Keep out of reach of children.**

    If in eyes, wash immediately with running water for 15 minutes. Contact a Poison Control Centre or a physician. **If on skin**, wash with warm water and soap for 15 minutes. **If swallowed**, induce vomiting by giving the patient ipecac (adult or child 12 years or older, 30 mL; child under 12 – 15 mL), followed by water to enhance vomiting. Keep patient quiet and contact a Poison Control Centre or a physician, bringing the labelled container with you.

12. **Storage:** Store product in original container; store away from other pesticides, fertilizer, food or feed. Treated seed must be labelled as follows: **"This seed has been treated with Raxil FL – contains tebuconazole; do not use for food, feed or oil processing. Wear chemical resistant gloves when handling treated seed."**

Senator PSPT *(thiophanate methyl)*

Group 1

Manufacturer: Engage Agro Corporation

1. **Formulation: Senator Potato Seed Piece Treatment:** Dust; 10%; 10 kg bag.
2. **Registered Mixes:** None.
3. **Crops:** Senator PSPT: Potatoes.
4. **Diseases Controlled:** Fusarium rot, silver scurf (*Helminthosporium solani*), verticillium wilt. Also aids in control of seed piece decay and blackleg infections.
5. **When Used: Potato seed piece treatment:** Cut pieces should be treated within 6 hours of cutting. If planting is to be delayed more than 1 - 2 days, treated pieces should be stored for 2 - 3 days in open crates before bagging.
6. **How to Apply:**

   With: Senator PSPT: Convenient container or by dust attachment over belt.

   Rate: Potatoes: 500 grams per 100 kg of cut seed.

   Water volume: Potatoes: Do **not** add water.
7. **Application Tips:** For optimum control of silver scurf, ensure that seed tubers are completely free of soil. **Total skin coverage of potato is essential**. Reduced control can be expected in fields where volunteers from the previous year's crop act as a source of infection.

   Consult your provincial specialist for recommendations.
8. **How it Works:** Senator PSPT is a systemic and is translocated to the early seedling stage of the potato plant. Under cool, wet conditions, Senator PSPT may improve overall emergence due to protecting the tuber and seedling from Fusarium and seed piece decay.
9. **Grazing and Harvest Restrictions:** Potatoes: None.
10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD$_{50}$ (rats) technical = 7,500 mg/kg, Senator (non-toxic).
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    Do not contaminate domestic or irrigation water supplies, lakes, streams or ponds.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes. **If swallowed**, seek medical attention.
12. **Storage:** Store in a dry place.

Thiram 75WP *(thiram)*

Group M

Manufacturer: Gustafson Partnership

WARNING POISON

1. **Formulation:** Wettable powder; 75%; 5 kg, 25 kg bag.
2. **Registered Mixes:** None.
3. **Crops:** Alfalfa, dry beans, grasses, mustard, peas, safflowers, snap beans, soybeans, sugar beets, sweet corn.
4. **Diseases Controlled:** Damping off; seed decay; seedling blight (corn, beans, grasses, mustard, peas, soybeans, sugar beets); verticillium wilt (alfalfa).
5. **When Used:** Pre-seeding or drill box treatment: Treat seed before sowing. Seed should be well cured, dry and cleaned before treatment.
6. **How to Apply:**

With: Protective equipment, using standard dry seed treatment methodology described.

Pre-seeding treatment: Apply with any standard dry seed treatment application equipment or the shovel method.

Drill box treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix product and seed thoroughly until seed is a uniform colour by the following alternate mixing methods. (**Do not** mix with hands):

1. Place and level 1/2 of the seed in drill box and sprinkle 1/2 of the required amount of product uniformly over seed. Mix thoroughly with a paddle. Fill box with seed and sprinkle remaining 1/2 of product over seed, mix again, **or**
2. Dribble the required amount of product into seed as it is poured into drill box. Thoroughly mix with a paddle when drill box is 1/2 full and again when full, **or**
3. Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.

Rate:

Crop	Disease	Powder g/25 kg seed
Alfalfa	Verticillium wilt	90
Dry bean, pea, snap bean, soybean	Damping off, seed decay, seedling blight	25 - 35
Field corn	Damping off, seed decay, seedling blight	30
Grasses, mustard, sugar beet	Damping off, seed decay, seedling blight	90
Safflower	Damping off, seed decay, seedling blight	50
Sweet corn	Damping off, seed decay, seedling blight	55

Water volume for Thiram 75WP:

Slurry treatment on alfalfa and peas: Pre-mix Thiram 75WP in water as indicated below and apply with commercial seed treating equipment.

kg Thiram 75WP	L of water	Alfalfa, kg of seed treated	Peas, kg of seed treated
1.5	5	416	1,070 - 1,498

7. **Application Tips:** Mustard: Mix powder and seed in drill box. Simultaneous treatment with an insecticide for control of flea beetles is recommended (also see the manual sections on carbofuran and terbufos).
8. **How it Works:** Thiram is a protective fungicide applied as a seed-treatment powder.

Thiram 75WP (cont'd)

9. **Grazing and Harvest Restrictions:** Do not graze treated areas or feed from treated areas to livestock. Do not expose treated seed to birds and other wildlife.

   Seed treatment: Do not graze for 4 weeks after planting.

10. **Toxicity:** Low mammalian toxicity. Acute oral LD$_{50}$ (rats) thiram = 780 - 865 mg/kg, product (800 - 3,100). May irritate eyes, nose, throat or skin. May cause allergenic exzema in sensitive individuals.

11. **Precautions, First Aid:** Consumption of alcohol 24 hours before and after working with thiram or thiram-treated seed may cause sweating, flushing and nausea. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes. **If swallowed**, seek medical attention. Take labelled container with you.

12. **Storage:** Store in a cool, dry, ventilated place away from food or feed. Keep away from fire or sparks. Stored treated grain should be labelled: **"Do not use for food or feed. This seed has been treated with Thiram. Poisonous to man and animals. Keep out of reach of children."**

Vitavax Powder/Vitaflo 280

(carbathiin + thiram)

Group 7,M

Manufacturer: **Gustafson Partnership**

WARNING POISON

1. **Formulation:** Dust; 26.7% carbathiin + 38.8% thiram; 1.5 kg tube. Suspension: Vitaflo 280, 10 L, 200 L.
2. **Registered Mixes:** None.
3. **Crops: Vitavax powder:** Bromegrass, barley, flax, oats, rye, soybeans, wheat. **Vitaflo 280:** Barley, corn, dry beans, flax, lentils, oats, peas, rye, soybeans, triticale, wheat.
4. **Diseases Controlled:**

Crop	Vitavax Powder	Vitaflo 280
Barley	Covered smut, false loose smut, true loose smut	Covered smut, false loose smut, seed decay, seedling blight, true loose smut Suppression of net bloch
Bromegrass	Head smut	–
Dry beans, snap beans	–	Damping off, seed decay
Canola (export only)	–	Alternarina blight, damping off, Phythium and seedling decay, Ploma (blackleg), *Rhizoctiona solani*, seed decay, seedling blight
Field corn, sweet corn	–	Damping off, seed decay
Flax including Linola	Damping off, seed decay	Seed rot, seedling blight
Lentils	–	Seedling blight caused by Fusarium and Phythium

(continued)

(continued)

Crop	Vitavax Powder	Vitaflo 280
Oats	Covered smut, loose smut, seed decay, seedling blight	Covered smut, loose smut
Peas	–	Seedling blight caused by Fusarium and Phythium
Rye	Damping off, seed decay, seedling blight, stem smut	Damping off, seed decay, seedling blight, stem smut
Soybeans	Damping off, seed decay	Damping off, seed decay
Triticale	Damping off, seed decay, seedling blight	Damping off, seed decay, seedling blight
Wheat	Covered smut, loose smut	Covered smut, loose smut, seed decay, seedling blight

5. **When Used:** Drill box treatment: treat seed before sowing. Seed should be well cured, dry and cleaned before treatment. Do not store treated seed.

Vitaflo 280: Seed should be dry and cleaned before treatment. Seed can be treated prior to seeding.

6. **How to Apply:**

With: Protective equipment, using standard dry seed treatment methodology described.

Vitaflo 280: On-farm treatment using an auger with a pump, or a dripolater device or custom application at seed cleaning plants. This is a water-based formulation.

Pre-seeding treatment: At the start, treat enough seed in a separate container to cover bottom of empty drill box. Mix product and seed thoroughly with a stick or paddle until seed is a uniform colour. Do **not** mix with hands. Fill the drill or planter box to 1/2 capacity and sprinkle 1/2 the required amount of powder over the seed and mix thoroughly. Seed should all be pink. Then add enough seed to fill the box, cover with the remaining powder and repeat mixing procedure. For large drill or planter boxes, it may be necessary to divide the seed into several portions. Clean planter plates periodically to prevent excessive build-up of treatment chemicals.

Rate:

Crop	Vitavax Powder undiluted (mL/100 kg seed)	Vitaflo 280 undiluted (mL/100 kg seed)
Barley	200	230 - 330*
Bromegrass	460	–
Dry beans, snap beans	–	260
Canola (export only)	–	600**
Field corn, sweet corn	–	260
Flax (including Linola)	240	525
Lentils	–	330
Oats	280	330
Peas	–	330
Rye	180	230 - 330*
Soybeans	260	260
Triticale	–	200
Wheat	160 - 220	230 - 330

* Use higher rates for true loose smut or stem smut.

7. **Application Tips:** Vitavax Powder has no vapour action; therefore, thorough seed coverage is required. Seeding rate should be checked before planting and periodically during planting.

Vitavax Powder/Vitaflo 280 (cont'd)

8. **How it Works:** Thiram is a fungicide that controls diseases carried on the seed. Carbathiin is a systemic fungicide that penetrates the seed coat to control diseases inside the seed and seedling.
9. **Grazing and Harvest Restrictions:** Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.
10. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) carbathiin: thiram = 1,600 mg/kg.
11. **Precautions, First Aid:** Do not consume alcohol within 24 hours before or after working with thiram; may cause flushing, sweating, headache and nausea. Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children.**

    If in eyes, flush immediately with running water. Get medical attention. **If on skin**, wash with warm water and pumice soap to remove dye. **If swallowed**, seek medical attention. Keep patient quiet. Intake may cause kidney, liver and nervous system damage. In severe cases, a coma may result.

    Symptoms of poisoning: Skin contact may result in irritation and dermatitis.
12. **Storage:** Do not store product in or around the home or near food or feed. Store powder in a dry area.

Vitavax rs Fungicide

(carbathiin + thiram)

Group 7,M

Manufactor: **Gustafson Partnership**

☠ CAUTION POISON

1. **Formulation:** Flowable 5.97% carbathiin + 11.94% thiram.
2. **Registered Mixes:** Compatible on the seed with Apron FL and Gaucho 480.
3. **Crops:** Canola, mustard, rapeseed.
4. **Diseases Controlled:** Seed-borne blackleg. Seed rot and seedling blight caused by Alternaria, Pythium and Rhizoctonia.
5. **When Used:** Available to custom seed applicators only.
6. **How to Apply:** Apply 833 - 1,250 mL per 100 kg of seed. Can be applied with the Magna Coating.
7. **Application Tips:** Applicators should consult with Gustafson regarding application procedures for combining with Apron FL and Gaucho 480.
8. **How it Works:** Thiram is a contact fungicide. Carbathiin is a systemic fungicide that protects the seed and seedling from disease.
9. **Grazing and Harvest Restrictions:** Do not graze or feed livestock for four weeks after planting.
10. **Toxicity:** Moderate acute mamalian toxicity.
11. **Precautions, First Aid:** Do not reuse container for any purpose. Work in a well ventilated area when treating seed or while augering or handling treated seed. Augers used for handling treated seed should not be used to move seed for feed, food or oil processing. Do not reuse bags from treated seed to handle food or feed products. Do not contaminate feed or foodstuffs with treated seed. **Keep out of reach of children.**

If in eyes, wash immediately with running water for 15 minutes. Contact a Poison Control Centre or a physician. **If on skin**, wash with warm water and soap for 15 minutes. **If swallowed**, induce vomiting by giving the patient ipecac (adult or child 12 years or older, 30 mL; child under 12 - 15 mL), followed by water to enhance vomiting. Keep patient quiet and contact a Poison Control Centre or a physician, bringing the labelled container with you.

12. **Storage:** Store product in original container; store away from other pesticides, fertilizer, food or feed. Storage at low temperatures is not recommended. Treated seed must be labelled as follows: **"This seed has been treated with Vitavax rs Fungicide – contains carbathiin and thiram; do not use for food, feed or oil processing. Wear chemical resistant gloves when handling treated seed."**

Vitavax Single Solution

(carbathiin)

Group 7

Manufacturer: **Gustafson Partnership**

CAUTION POISON

1. **Formulation:** Solution; 230 g/L; 10 L, 200 L containers.
2. **Registered Mixes:** None.
3. **Crops:** Barley, flax, oats, rye, wheat.
4. **Diseases Controlled:**

Barley	Flax	Oats	Rye	Wheat
Covered smut, false loose smut, true loose smut Suppression of common root rot, leaf stripe, net blotch*	Damping off, seed decay	Covered smut, loose smut Suppression of common root rot*	Stem smut Suppression of common root rot*	Bunt (stinking smut), true loose smut Suppression of common root rot*

* Seed treatment will not protect post-seedling plants from infection.

5. **When Used:** A ready-to-apply formulation for commercial treaters and on-farm auger treating. Chemical is added directly to the seed as it enters the mixing chamber or auger. Seed may be planted immediately.
6. **How to Apply:**

With: On-farm treatment: through the auger with special equipment, or with an inexpensive pump or dripolator device, or treat at a seed cleaning plant.

Water volume: Do **not** dilute with water.

Vitavax Single Solution (cont'd)

Rate:

Crop	mL/25 kg seed
Barley	60 - 75*
Flax	100
Oats	60
Rye	60
Wheat	60 - 75*

* For wheat and barley varieties highly susceptible to true loose smut and for high levels of smut or bunt on seed, the 75 mL rate will give increased disease control.

7. **Application Tips:** Run auger at less than capacity to provide adequate mixing. Uniform coverage at the correct rate is important for satisfactory results. Under-treatment results in loss of efficacy and over-treatment may reduce germination. Calibrate seeding equipment using treated seed to ensure proper seeding rate.
8. **How it Works:** Carbathiin, a systemic fungicide, penetrates the seed coat to control disease.
9. **Grazing and Harvest Restrictions:** Treated seed not to be used for food, feed or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.
10. **Toxicity:** Low mammalian toxicity. Acute oral LD_{50} (rats) carbathiin = 3,820 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    Do not reuse bags from treated seed or auger used for treated seed for other purposes.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
    If swallowed, seek medical attention.
12. **Storage:** Store above 0°C. Do not store in or around the home. Label stored treated seed: **"Do not use for food, feed or oil processing. This seed has been treated with carbathiin. Keep out of reach of children."**
13. **Resistance Management:** Vitavax Single solution contains a Group 7 fungicide. Any fungal population may contain individuals naturally resistant to Vitavax Single solution and other Group 7 fungicides. A gradual or total lost of pest of control may occur over time if these fungicides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

Acrobat MZ *(dimethomorph + mancozeb)*

Group 5,M

Manufacturer: **BASF Canada**

1. **Formulations:** Wettable powder; 69%; 10 kg bag.
2. **Registered Mixes:** None.
3. **Crops:** Potatoes.
4. **Diseases Controlled:** Early blight, late blight. Reduction of tuber blight.
5. **When Used:** First application when disease threatens or when first visible signs of disease occur within the field or nearby. Apply every 5 - 7 days under high disease pressure or every 7 - 10 days under low disease pressure. It is recommended that Acrobat MZ be applied in alternation with a fungicide having a different mode of action. Under high levels of late blight infection, apply after top kill to control tuber blight.
6. **How to Apply:**

   With: Aircraft or ground equipment.

   Rate: 1 kg/ac.

   Water volume: Ground: At least 80 L of water per acre. Air: 20 L of water per acre.
7. **Application Tips:** Good spray coverage is required. It is essential to use Acrobat MZ as part of a regularly scheduled preventative fungicide program.
8. **How it Works:** Acrobat MZ provides the systemic activity of dimethomorph and the contact activity of mancozeb to prevent both early and late blight. The dimethomorph penetrates the plant and moves upward to protect the leaves and stems, while the contact activity prevents blight on the plant surface. Acrobat MZ has anti-sporulant activity and is active against most stages of the late blight pathogen.

   Effects of rainfall: Do not apply if rain is likely within 2 - 3 hours of spraying. Apply to dry foliage.
9. **Grazing and Harvest Restrictions:** Do not apply within 14 days of harvest. Do not plant a new crop in the treated area within 120 days of the last application. Use a maximum of 3 applications per season.
10. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 1,971 mg/kg. Highly toxic to aquatic organisms.
11. **Precautions, First Aid:** During all activities, workers must wear long pants, long-sleeved shirt and boots. During mixing, loading, cleanup and repair activities, workers must also wear chemical-resistant gloves and safety goggles or a face shield. **Keep out of reach of children and animals**.

    If in eyes, flush eyes with water. Get medical attention if irritation persists. **If on skin**, wash skin with plenty of soap and water. Get medical attention if irritation persists. **If inhaled**, move subject to fresh air. **If swallowed**, dilute by giving 2 glasses of water and induce vomiting. Do not induce vomiting or give anything by mouth to an unconscious person.

    Symptoms of poisoning: Unknown.

    For physician: There is no specific antidote. Treat symptomatically.

    In case of a spill: Wear personal protective equipment. Absorb spillage with sand or earth. Scrub contaminated surfaces with detergent solution and contact the manufacturer or Provincial Regulatory Agency for disposal.
12. **Storage:** Store under cool and dry conditions in secure, well ventilated buildings away from foodstuffs and animal feed and out of reach of children.

Benlate 50WP/ Benlate Toss-N-Go *(benomyl)*

Group 1

Manufacturer: **DuPont Canada Inc.**

1. **Formulation:** Wettable powder; 50%; 10 kg bags. Toss-N-Go, 5 kg (5 x 1 kg water soluble pouches).
2. **Registered Mixes:** No registered mixes for canola or beans.

   Mixing restrictions: Do not mix with alkaline pesticides such as basic copper sulphate, Bordeaux mixture or lime sulphur. Do not tank mix or alternate Benlate with thiophanate products such as Easout.

   Mixing instructions:

   1. Wear protective clothing such as coveralls, goggles or face shield and suitable chemical resistant gloves during mixing and loading. Do not handle Toss-N-Go bags with wet gloves or place on wet surfaces.
   2. Add the required amount of Benlate Toss-N-Go bags to a 1/4 to 1/3 full tank of clean water with no agitation.
   3. Avoid stacking bags or conditions that could cause laminating or folding of Toss-N-Go bags' film onto itself. The bags should be floating free of one another on the surface of the water.
   4. Do not cut or pierce the Toss-N-Go bags during the loading operation.
   5. Use a rinse-down nozzle (low pressure) to wet the tops of the Toss-N-Go bags for a wetting period of 45 seconds. Centre nozzle in top of tank if possible, for maximum coverage. Plumb clean water through the rinse-down nozzle; if possible, supply warm water to nozzle. Allow 45 seconds from loading the final Toss-N-Go bag into the tank until agitation is turned on. Use 5 - 10 gal/min. to wet the tops of the bags as evenly as possible. Do **NOT** agitate the tank during this period.
   6. If a rinse-down nozzle is not available, allow the Toss-N-Go bags to float in the tank for 45 seconds without agitation.
   7. Once the 45 seconds wetting period is complete, continue filling the tank to the required volume with the agitator running full. Apply the mixture the same day. Do not leave overnight.

   The situation you are trying to create is a floating bag that is being gently showered from above with clean water. When this step is done, without agitation, the Toss-N-Go bags are allowed to hydrate prior to agitation. The end result should be fully dissolved bags within about a 4-minute period, from start of loading the bags into the tank to the time the bags dissolve.
3. **Crops:** Alfalfa grown for seed, canola, dry beans, lima beans, snap beans.
4. **Diseases Controlled:** Botrytis (beans), Sclerotinia (beans, canola), Sclerotinia, Botrytis (alfalfa).
5. **When Used:** Do not make more than 2 applications per crop unless otherwise specified.

   Alfalfa: Alfalfa for seed from early to late bloom (not more than 2 applications per year).

   Beans: Between 50% and full bloom.

   Canola: Can be applied up to the 50% bloom stage. Optimal protection is the 20 - 30% bloom stage, which is before the first petals begin to fall and when there is the maximum number of petals and buds that can be covered by the spray application.
6. **How to Apply:**

   With: Aircraft or ground equipment.

   Water volume: Beans: air – 16 L/ac, ground – 40 - 80 L/ac. Canola: air – 16 L/ac minimum, ground – 32 - 40 L/ac.

   Nozzles: Flat fan or hollow cone.

Rate: Use the high rate for application after 30% bloom or under severe or prolonged disease conditions, high humidity or excessive rainfall.

Crop	Disease	g/ac
Canola	**Sclerotinia** (stem rot)	303 - 606
Dry beans, snap beans	**Botrytis** (grey mold)	707 - 909
Lima beans	**Sclerotinia** (white mold)	707 - 909
Seed alfalfa	**Sclerotinia, Botrytis** (blossom blight)	606

7. **Application Tips:** Canola: Thorough coverage of plant parts prior to infection is essential for effective disease control. Ensure continuous agitation in the spray tank until all the spray solution is sprayed out.
8. **How it Works:** Benlate provides protection against disease both on the surface as well as in the interior of the plant. Benlate has two properties that insure its curative control of Sclerotinia and Botrytis:
   1. The ability to inhibit the growing point of the Hyphae in estabilished lesions
   2. The systemic movement of Benlate to the target site.

   Effects of rainfall: Rain-free period is 1 - 2 hours. Effects of irrigation: do not irrigate within 6 hours of application.
9. **Grazing and Harvest Restrictions:** Pre-harvest interval (days): Beans (14). Do not graze or feed treated bean hay or alfalfa to livestock. Maximum allowable applications: Alfalfa (2).
10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD$_{50}$ (rats) technical = >10,000 mg/kg. May irritate eyes, nose, throat and skin. Toxic to fish.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children.**

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes. **If swallowed**, seek medical attention.
12. **Storage:** Never allow product to become wet during storage as reduced fungicidal effectiveness may result. Keep container closed when not in use. Keep away from fire or sparks.

Bravo 500 *(chlorothalonil)*

Group M

Manufacturer: Syngenta Crop Protection Canada Inc.

CAUTION POISON

1. **Formulation:** Flowable; 500 g/L; 10 L, 110 L, 200 L, 2 x (0.83 L + 8L).
2. **Registered Mixes:** None.

   Mixing instructions: The required amount of Bravo 500 should be added slowly into the spray tank during filling. With concentrate sprays, pre-mix the required amount of Bravo 500 in a clean container and add to the spray tank as it is being filled. Keep agitator running when filling spray tank and during spray operations.
3. **Crops:** Blueberry, broccoli, brussel sprouts, cabbage, carrot, cauliflower, celery, chickpeas, conifers, cucumber, field peas, lentil, melons, potato, pumpkin, squash, strawberry, sweet corn, tomato, wheat.
4. **Diseases Controlled:** Anthracnose, Ascochyta (chickpeas, field peas, lentils), Botrytis (potatoes), early and late blight, Septoria glume blotch, Septoria leaf spot, suppression of Fusarium head blight (wheat), tan spot.

Bravo 500 (cont'd)

5. **When Used:** Bravo 500 can be used effectively in diluted or concentrated sprays.
6. **How to Apply:**

With: Ground field sprayers, high clearance sprayers, aircraft.

Water volume: 91 - 650 L/ac for dilute applications; 20 - 40 L/ac for concentrate ground and aerial applications.

Pressure: 345 - 1,380 kPa.

Nozzles: Hollow cone or flat fan. Cone type nozzles are preferred since they will improve coverage.

Rate:

Crop/disease	Use recommendation
Chickpea	
Ascochyta	Use 1.2 L - 1.6 L/ac in the first application and 0.8 L - 1.2 L/ac in subsequent applications. Make the first application at *very* early flowering and remaining applications at 10-day intervals. Do not make more than 3 applications per season.
Field peas	
Ascochyta blight *Mycospharella* pinodes	Apply Bravo at a rate of 0.8 L to 1.25 L/ac beginning at early flowering. Make a second application at early pod set (mid-flowering), about 10 days after the first application. If conditions remain favorable for disease, a third application should be made at 10 - 14 days later during pod filling. Always apply the higher rate when conditions are favorable for disease. Do not make more than 3 applications per season.
Lentil	
Anthracnose, Ascochyta blight	Use recommendations. Use 0.8 - 1.6 L/ac in 91 - 650 L water/ac beginning at pre-flowering prior to row closure, make a second application 10 - 14 days after the first application (during bloom period). Do not make more than two applications per season. Do not apply Bravo in combination with Poast herbicide and Merge surfactant or within 48 hours of the application of Poast and Merge.
Potato	
Early blight or Botrytis vine rot	Use 0.65 - 1.0 L
late blight	Use 0.45 - 0.97 L Use sufficient water to obtain adequate spray coverage. Begin applications when plants are 15 - 20 cm high or when disease threatens. Repeat applications at 7 - 10 day intervals or as necessary to maintain disease control. Under severe disease conditions, use the higher rates at 7-day intervals.
Wheat	
Septoria leaf spot, Septoria glume blotch, tan spot	Apply Bravo at 0.6 L to 1.0 L/ac at Zadoks growth stage 37 (flag leaf emergence), and repeat 10 - 14 days later at Zadok's growth stage 51 - 55 (head visible). A third application at Zadok's 59 - 69 (head fully visible) may be necessary if conditions favor disease spread.
Wheat	
Suppression of Fusarium head blight (scab)	Apply Bravo at 0.8 L to 1.0 L/ac at Zadoks growth stage 61 - 65 (early flowering) to suppress Fusarium head blight. For best results, this application must be made prior to conditions favoring infection, before flowering has started in the majority of tillers. Do not make more than 3 applications per season.

7. **Application Tips:** Thorough, uniform coverage is essential for disease control. Bravo is rainfast once the spray solution has dried on the plant surface.
8. **How it Works:** A contact and protectant fungicide.

9. **Grazing and Harvest Restrictions:** Do not feed or allow grazing of treated material to livestock.

Crop	Days to harvest	Crop	Days to harvest
Chickpea, lentil	48	Potato	1
Field peas	32	Wheat	30

10. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) = 4,200 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children.**

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes. **If swallowed**, seek medical attention. Take labelled container with you. Avoid breathing spray mist.

    Precautions: Do not re-enter treated area within 48 hours. If required, individuals may re-enter treated area within 48 hours for short term tasks not involving hand labour, only if at least 4 hours has passed since application. Long pants, long-sleeved shirt, hat and chemical resistant gloves should be worn.

    Note: Bravo 500 may produce temporary allergic side effects, characterized by redness of the eyes, mild bronchial irritation and redness or rash on exposed skin areas. Persons having allergic reactions should contact a physician. Affected persons respond to treatment with antihistamines or steroid creams and/or systemic steroids. Apply only to areas specified on label. This product is toxic to fish. Keep out of lakes, streams or ponds. **Do not** contaminate water by cleaning of equipment or disposal of wastes. **Do not** apply where runoff is likely to occur. **Do not** apply when weather conditions favour drift from areas being treated.
12. **Storage:** Do not store near food or feed. Protect from excessive heat.

Curzate 60 DF *(cymoxanil)*

Group 11

Manufacturer: **DuPont Canada Inc.**

DANGER POISON

1. **Formulations:** Dry flowable 60%, 1.8 kg
2. **Registered Mixes:** Manzate 200 DF

    Mixing instructions:

    Ensure the spraying equipment is clean.

    1. Fill spray tank 1/4 - 1/3 full with clean water and engage agitation. Prepare mixture volume to apply a minimum of 200 litres spray volume per hectare.
    2. With the agitator running, add the required amount of Curzate 60 DF slowly to the spray tank. Then add the required amount of Manzate 200 DF to the spray tank while maintaining the spray solution agitation.
    3. Continue to agitate until Curzate 60 DF and Manzate 200 DF are completely dispersed.
    4. Completely fill the remainder of the spray tank with water.
    5. On repeat tank loads, draw down the tank contents to less than 10% of the original volume, and repeat from step 1. If more than 10% of the spray volume remains, pre-slurry the Curzate 60 DF and Manzate 200 DF in a bucket of water before adding to the spray tank.

    Note: Continuous agitation is required to keep Curzate 60 DF and Manzate 200 DF in suspension in the spray tank for a uniform application.

    Use spray preparation of Curzate 60 DF and Manzate 200 DF within 48 hours, or product degradation may occur. If spray preparation is left standing without agitation, thoroughly agitate before spraying.

Curzate 60 DF (cont'd)

3. **Crops:** Potatoes
4. **Diseases Controlled:** Late blight (*Phytophthora infestans*)
5. **When Used:** Use Curzate 60 DF only in a tank mix with Manzate 200 DF.

   Initial application should start when local conditions indicate that late blight is imminent; make additional applications at 5 - 7 day intervals.
6. **How to Apply:**

   With: Ground equipment only. Do not apply by air.

   Rate: Apply Curzate 60 DF at 0.091 kg/ac plus Manzate 200 DF at 0.65 kg/ac

   Water volume: 20 - 100 L/ac.

   Pressure: 210 - 275 kPa

   Nozzles: Hollow cones or flat fan. Do not use flood jet nozzles. Use 50 mesh screens or larger.

   Sprayer cleanup: Immediately after application, thoroughly remove all traces of Curzate 60 DF and Manzate 200 DF from mixing and spray equipment. Follow these instructions:

   1. Completely drain tank, then flush tank, boom and hoses with clean water for a minimum of 10 minutes. Visually inspect tank to assure removal of all visible residues of Curzate 60 DF and Manzate 200 DF. If necessary, repeat step 1.
   2. Do not clean sprayer near well or water source or near desirable vegetation.
   3. Remove the nozzles and screens, and clean separately in a bucket containing cleaning agent and water.
   4. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing water through the hoses and boom.
7. **Application Tips:** Do not apply to a potato crop that is suffering from stress as a result of drought, water saturation, low temperatures, insect infestations, nutrient deficiency or any other factors contributing to a reduction in crop growth.

   Do not apply product during periods of intense rainfall, or to soils saturated with water. Do not apply directly to standing or running water. Do not apply in areas where surface water from treatment site can runoff to adjacent cropland, either planted or to be planted, or into streams, irrigation waters or wells. Do not contaminate any body of water, including irrigation water.

   Care must be taken to avoid spray drift outside the target area or onto ponds, waterways or ditches.
8. **How it Works:** The active ingredient cymoxanil in Curzate 60 DF is a highly active, locally systemic fungicide recommended for the control of late blight on potatoes. It works at several levels of preventative, curative and inhibitive (against sporulation).

   Curzate offers a unique feature for late blight management called "kick-back" activity. It controls infections that have already attacked the crop but are not yet visible. This unique activity is especially important in preventing late blight flare-ups after an infection period has already occurred or in areas more prone to disease because of microclimates. Kick-back is also important for protecting new foliage that developed after the last fungicide treatment. The active ingredient mancozeb in Manzate 200 DF is a dithiocarbamate fungicide with contact activity.

   Effects of rainfall: Curzate is rainfast within 2 hours after application.
9. **Grazing and Harvest Restrictions:** Do not harvest within 8 days of treatment. Do not re-enter treated area within 24 hours. A buffer zone of 50 metres is required between the downwind edge of the boom and sensitive aquatic habitats such as ponds, lakes, rivers, streams and wetlands. Do not contaminate these habitats when cleaning and rinsing equipment or containers. Do not mix, load or apply within 15 metres of all wells. Do not use on hydroponically grown crops or on any container-grown crops or ornamentals.
10. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = >433 mg/kg. May irritate eyes, nose, throat and skin. May be harmful if inhaled or swallowed.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, unlined nitrile or neoprene overboots or rubber boots. In addition, wear a waterproof apron and respirator when handling the pesticide concentrate. Follow directions for cleaning of clothes and equipment before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention.
12. **Storage:** Store product in original container in a secure, dry area away from food or feed. Protect against humid air and water. Not for use or storage in or around the home. Keep container tightly closed.
13. **Resistance Management:** Since Curzate 60 DF is to applied **only** in a tank mix with Manzate 200 DF, two fungicides having different modes of action, there is a low potential for resistance build-up. Thus, the Curzate 60 DF and Manzate 200 DF tank mix should be used in alternation with other fungicides as a resistance management tool in a integrated pest management program. When fungicides with the same mode of action are used repeatedly over several years in the same field, naturally occurring, less sensitive strains may survive, propagate and become dominant in the field.

Dithane DG Rainshield NT/ Manzate 200/ Penncozeb 75DF/ *(mancozeb)*

Group M

Manufacturer: **Dow AgroSciences Canada/DuPont Canada/United Agri Products**

1. **Formulation:** Dispersible granule; Dithane DG Rainshield NT; 75%; 20 kg bag. Manzate 200; 80%; 2.5 kg, 20 kg bags.
2. **Registered Mixes:** A dust may be prepared by diluting and thoroughly mixing Manzate 200 with prophylite or other neutral diluent; commonly used insecticides may displace an equivalent amount of diluent. Use dust mixtures as soon as possible after preparation. A spreader-sticker may be added to Manzate 200 in spray preparations.
3. **Crops:** Lentils, potatoes, sugar beets, wheat (all varieties, including durum).
4. **Diseases Controlled:**

   Anthracnose (lentils)
   Ascochyta blight (lentils)
   Cercospora leaf spot (sugar beet)
   early and late blights (potato)
   leaf rust (wheat)
   root rot (corn)
   seedling blight (corn)
   Septoria (wheat)
   tan spot (wheat)
5. **When Used:**

   Foliar sprays:

   Lentils: Apply the first application before flower when bud formation is evident. A second application should be applied 10 - 12 days after the initial application, but before rows close in to form a dense canopy. If conditions for disease persists, a third application may be applied 10 - 14 days later.

   Early and late blights in potatoes: Apply when plants are 10 - 15 cm tall; repeat at 7 - 10 day intervals.

   Cercospora leaf spot in sugar beets: Apply when disease first threatens and repeat at 7 - 10 day intervals.

   Foliar spray on wheat: An early application can be made at Feeks 1 - 3 growth stage or when crop is in the 3 leaf to tillering stage and/or a late application can be made at Feeks 10.5 when the head is fully emerged but prior to flowering.

Dithane DG Rainshield NT/Manzate 200/Penncozeb 75DF (cont'd)

6. **How to Apply:**

With: Aircraft, ground equipment.

Water volume: Aircraft: 18 L/ac (4 gallons/ac); Ground: 45 - 80 L/ac (10 - 18 gallons/ac); Sugar beets: 324 L/ac.

Pressure: 345 kPa.

Nozzles: Hollow cones or flat fan recommended.

Rate: Potatoes: start with low rate and increase to maximum rate as foliage develops.

Crop	Disease	Formulation	Quantity
Foliar sprays			
Alfalfa	Root rot, seedling blight	Dithane DG Rainshield NT	0.59 kg/ac
Lentils	Anthracnose, Ascochyta blight	Dithane DG Rainshield NT	0.9 kg/ac
Potatoes	Early and late blight	Manzate 200,	0.44 - 0.90 kg/ac
Sugar beets	Cercospora leaf spot	Manzate 200, Dithane DG Rainshield NT	0.91 kg/ac
Wheat	Leaf rust, Septoria, tan spot	Dithane DG Rainshield NT	Early spray: 0.45 kg/ac Late spray 0.9 kg/ac

7. **Application Tips:** Sprays: Continuous agitation required.

8. **How it Works:** A contact fungicide.

9. **Grazing and Harvest Restrictions:**

Application restrictions: Do not make more than 2 applications of Dithane DG Rainshield NT in wheat during the season. Do not make more than 3 applications of Dithane DG Rainshield NT in lentils during the season.

Grazing restrictions: Do not graze treated crops or cut for hay; there is insufficient data to support such use.

Pre-harvest interval (days): Lentils (35), potatoes (1), sugarbeets (21), wheat (40).

10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) mancozeb = 11,200 mg/kg. Prolonged exposure may cause eye, nose, throat and skin irritation.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27) for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
If swallowed, seek medical attention.

12. **Storage:** Store in a cool, dry, ventilated place away from fire and sparks. Do not allow product to become wet or overheated during storage as chemical changes may reduce fungicidal effectiveness and flammable vapours may be generated. Treated seed should be labelled: **"Do not use for food or feed. This seed has been treated with mancozeb. Poisonous to man and animals. Keep out of reach of children."**

Dithane M-22 *(maneb)*

Group M

WARNING POISON

Manufacturer: **United Agri Products/Dow AgroSciences Canada Inc.**

1. **Formulations:** 80% wettable powder; 10 kg bag.
2. **Registered Mixes:** Compatible with most insecticides and fungicides but not with Bordeaux mixture or lime.
3. **Crops:** Potatoes.
4. **Diseases Controlled:** Early and late blight of potatoes.
5. **When Used:** Apply early (when plants are 15 cm high) and treat at 7 - 10 day intervals throughout the season. Shorten interval to 5 - 7 days when weather favours disease.
6. **How to Apply:**

   With: Protective equipment.

   Water volume: Foliar spray: Potatoes: 325 - 405 L/ac; Heavy vines: 405 - 610 L/ac.

   Rate: Potatoes* (early, late blight) 700 - 910 g/ac.

   * Increase the rates as vines increase in size.
7. **Application Tips:** Treat only the amount of seed to be sown to avoid the problem of storing treated seed. Slurry treatment not recommended for flax. Calibrate treater prior to treating seed. Use only recommended rates. Lower amounts may not give the desired control. Excessive amounts may cause seed injury.
8. **How it Works:** Dithane M-22 is a foliar applied fungicide, effective against many foliar diseases.
9. **Grazing and Harvest Restrictions:** Pre-harvest interval (days): Potatoes (1).
10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) maneb = 6,750 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse.

    If in eyes or on skin, use standard first aid measures. **If swallowed**, seek medical attention. Take patient to nearest hospital, taking the labelled container with you.
12. **Storage:** Store product in a cool, dry place away from food or feed. Prevent the contents from becoming wet as this will reduce effectiveness and may cause flammable vapours. Keep away from fire and sparks. Stored, treated grain should be labelled: **"Do not use for food or feed. This seed has been treated with maneb. Poisonous to man and animals. Keep out of reach of children."**
13. **Resistance Management:** Dithane M-22 is a group M fungicide. Any fungal population may contain individuals naturally resistant to Dithane M-22 and other group M fungicides. A gradual or total loss of pest control may occur over time if these fungicides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

Gavel 75 DF *(mancozeb + zoxamide)*

Group M,22

Manufacturer: **Dow AgroSciences Canada Inc.**

1. **Formulations:** 66.7% mancozeb and 8.3% zoxamide formulated as a dry flowable; 20 kg bag.
2. **Registered Mixes:** None.
3. **Crops:** Potatos.
4. **Diseases Controlled:** Early and late blight.
5. **Rate:** 0.69 to 0.90 kg/ac.
6. **How to Apply:**

   With: Ground equipment or aircraft

   Water volume: Ground equipment: 90 L/ac. Aircraft: 18 to 36 L/ac.

   Nozzles: Ground equipment: Generally hollow cone, disc – D5 to D7.
7. **Application Tips:** Optimum disease control is achieved when the fungicide is applied in a regularly scheduled preventative spray program. Begin applications at the first sign of disease or when blight is reported in the area. Apply Gavel at 0.90 kg/ac every 7 days under high disease pressure when either disease is present and environmental conditions favour continued disease development. Gavel can be applied at 0.68 kg/ac every 7 days under low disease pressure and environmental conditions unfavourable for disease development. Thorough, uniform coverage is essential for good disease control. Under high disease pressure, use higher water volume (36 L/ac) to provide better crop coverage. For best results, use hollow cone brass nozzles with a D-series orifice discs and cores (whirlplate). Nozzles should point straight down or slightly backward.
8. **How it Works:** The active ingredient zoxamide is a benzimidazole type fungicide with contact activity. The mancozeb component is a dithiocarbamate fungicide with contact activity.
9. **Grazing and Harvest Restrications: Preharvest interval:** 3 days. **Recropping:** A 30 day plant back interval (PBI) is required for leafy vegetables and root and tuber vegetables. For all other crops not included on the label, the PBI should be 140 days. **Applications:** Maximum of 6 applications per season.
10. **Toxicity:** Practically non-toxic, oral LD_{50} (rats) >5,000 mg/kg. Toxic to fish. Drift and runoff from treated areas may be hazardous to aquatic organisms. Do not apply directly to water or to areas where surface water is present.
11. **Precautions, First Aid: If in eyes**, hold eye open and rinse slowly and gently with water for 15 - 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a Poison Control Centre or doctor for treatment advice. **If on skin or clothing**, take off contaminated clothing. Rinse skin immediately with plenty of water for 15 - 20 minutes. Call a Poison Control Centre or doctor for treatment advice. **If inhaled**, move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a Poison Control Centre or doctor for further treatment advice. **If swallowed**, call a Poison Control Centre or doctor immediately for treatment advice. Have the person sip a glass of water if the person is able to swallow. Do not induce vomiting unless told to do so by a Poison Control Centre or doctor. Do not give anything by mouth to a unconscious person. Take container, label or product name and Pest Control Product Registration Number with you when seeking medical advice.
12. **Storage:** Do not allow product to freeze. Keep away from fire and sparks. Store in a cool, dry, well ventilated place away from feed or food.
13. **Resistance Management:** For resistance management, please note that Gavel 75 DF fungicide contains both a Group 22 and Group M fungicide. Any fungal population may contain individuals naturally resistant to zoxamide and other Group 22 or Group M fungicides. A gradual or total loss of pest control may occur over time if these fungicides are used repeatedly in the same fields.

Headline *(pyraclostrobin)*

Group 11

Manufacturer: **BASF Canada**

1. **Formulations:** Liquid; emulsifiable concentrate; 250g/L; 2 x 6.5 L jug or 104 L tote.
2. **Registered Mixes:** None.
3. **Crops:** Barley, chickpea, dry bean, fababean, field pea, grasses grown for seed (bluegrass, fescue, ryegrass), lentil, potatoes, rye, wheat, sugarbeets.
4. **Diseases Controlled:**

Crop	**Disease**	**Spray interval**
Cereals		
Barley	Net blotch (*Pyrenophora teres*), scald (*Rhynchosponum secalis*), spot blotch (*Cochliobolus sativus*), stripe rust (*Puccinia stiiformis*)	
Rye	Leaf rust (*Puccinia recondita*), powdery mildew (*Erysiphe graminis*)	
Wheat	Leaf rust (*Puccinia recondita*), powdery mildew (*Erysiphe graminis f. sp. tritici*), Septona leaf spot (*Septoria tritici* or *Septoria nodorum*), spot bloch (*Cochliobolus sativus*), stripe rust (*Puccinia striiformis*), tan spot (*Pyrenophora tritici-repentis*)	
Grasses grown for seed		
Bluegrasses, fescues, ryegrasses grown for seed	Leaf and stem rust (*Puccinia recondita* and *graminis*), powdery mildew suppression (*Erysiphe graminis*)	
Pulses		
Chickpeas	Ascochyta blight (*Ascochyta* spp.)	
Dry beans *Lupinus* spp.	Mycosphaerella blight (*Mycosphaerella* spp.), powdery mildew (*Erysiphe* spp.)	
Phaseolus spp.	Anthracnose (*Colletotrichum* spp.), powdery mildew (*Erysiphe* spp.), rust (*Uromyces* spp.)	
Vigna spp.	Anthracnose (*Colletotrichum* spp.), Mycosphaerella blight (*Mycosphaerella* spp.), powdery mildew (*Erysiphe* spp.), rust (*Uromyces* spp.)	
Dry field peas	Ascochyta blight (*Ascochyta* spp.), Mycosphaerella blight (*Mycosphaerella* spp.) powdery mildew (*Erysiphe* spp.)	
Fababean	Mycosphaerella blight (*Mycosphaerella* spp.), powdery mildew (*Erysiphe* spp.)	
Lentil	Anthracnose (*Colletotrichum* spp.), Ascochyta blight (*Ascochyta* spp.)	
Potatoes	Early blight (*Alternaria solani*) late blight (*Phytophthora infestans*)	7 - 14 days 5 - 7 days
Sugarbeets	Cercospera leaf spot (*Cercospera beticola*), powdery mildew (*Erysiphe betae*)	

5. **When Used:**

Chickpea, dry field bean, dry field pea, fababean, lentil: Apply at the beginning of flowering or at the onset of symptoms for the more aggressive diseases (anthracnose, ascochyta blight, powdery mildew); apply a second application 10 - 14 days later if disease persists or weather conditions are favourable for disease development. Early applications are key to optimizing disease control.

Barley, rye, wheat: To maximize yield in cereals, it is important to protect the flag leaf from disease. The optimum time for application is immediately after flag leaf emergence.

Grasses grown for seed: Apply prior to disease development; apply a second application 14 - 21 days later if disease conditions persist.

Potatoes: Applications should begin prior to row closure or before symptoms appear; do not make more than 6 applications of Headline per season.

Sugarbeets: Apply at the onset of cercospera leaf spot and powdery mildew; do not make more than 4 applications per season.

6. **How to Apply:**

With:

Cereals and pulses: Aircraft or ground equipment.
Grasses grown for seed, potatoes and sugarbeets: Ground equipment.

Rate:

Cereals: 120 mL/ac (for wheat only), 160 mL/ac.

Pulses: 160 mL/ac.
Grasses grown for seed: 160 - 270 mL/ac – use the higher rate when disease pressure is high.

Potatoes: Early blight: 180 - 270 mL/ac; Late blight: 180 - 360 mL/ac – use higher rates and shorter spray intervals under heavy disease pressure.

Water volume:

Aerial application: Minimum of 20 L/ac (4.5 gal/ac).
Ground application: Cereals, pulses and grasses grown for seed: Minimum of 40 L/ac (9 gal/ac).
Potatoes: Minimum of 80 L/ac (18 gal/ac).

As with all fungicides, coverage is very important and higher water volumes tend to increase performance with dense canopies.

Pressure: Consult nozzle manufacturers' recommendation for spray pressures for specific nozzles.

7. **Application Tips:** Clean the spray tank following sprayer cleanup recommendations on the label of the product applied previously. Fill the spray tank 1/2 full with clean water and begin agitation. Add the specified amount of Headline fungicide to the tank. Continue agitation while filling the tank to the desired volume to obtain the required spray concentration. Maintain agitation throughout the spraying operation. Good coverage is essential for effective disease control. Any reduction in water volume can reduce disease control.

As with all fungicides, Headline works better if it is applied in a preventative manner and performs best if applied in a regularly scheduled protective spray program.

8. **How it Works:** Headline has a protective effect because it inhibits spore germination and a curative-eradicative effect due to the inhibition of mycelial growth and sporulation of the fungus on the leaf surface. Headline works by first stopping the disease that is already present on the plant, and then by giving the plant protection against further disease infestation. Headline stops spores immediately upon germination and is systemic within the leaf. Headline applied to the top surface of the leaf binds tightly in the waxy cuticle and also moves to the lower surface where it again binds to the leaf surface to provide dual-sided protection against disease entry. Because Headline is locked into the waxy layer of the leaf, it is very rainfast (approximately one hour after application). Headline is curative and will control all stages of fungal development.

Effects of rainfall: Headline is rainfast within one hour of application.

9. **Grazing and Harvest Restrictions:** All crops can be grazed or fed to livestock.

Preharvest intervals: Cereals – apply no later than the end of flowering. Pulses – 30 days. Grasses – 14 days. Potatoes – 3 days. Sugarbeets – 7 days.

Crop rotation restrictions: Labelled crops can be planted immediately following application. All other crops can be planted 14 days after the last application.

Toxicity: Acute oral LD^{50} (rats) >500 mg/kg. Acute dermal LD$_{50}$ (rats) >4,000 mg/kg. Treat symptomatically.

Precautions, First Aid: Harmful if swallowed. Call a physician or poison control centre immediately. Drink large quantities of water. **Do not** induce vomiting or give anything by mouth to an unconscious person. Avoid contact with eyes, skin and clothing. **Keep out of reach of children.**

In case of eye contact, flush eyes immediately with flowing water for at least 15 minutes and consult a physician if irritation develops. **In case of skin contact**, wash with soap and water. Remove contaminated clothing and launder separately from household laundry before re-use. Consult a physician if irritation develops. **If inhaled**, remove person to fresh air. Assist breathing if necessary. Consult a physician immediately. Take container, label or product name and pest control product registration number with you when seeking medical attention. Wash thoroughly after handling and before eating, drinking or smoking. Wear long sleeved shirt, long pants, chemical resistant gloves, socks and footwear during mixing/loading, application, cleanup and repair. If clothing becomes contaminated, remove and wash separately from household laundry before reuse. Clean spray equipment thoroughly after use. Apply only when the potential for drift to areas of human habitation or areas of human activity such as houses, cottages, schools and recreational areas is minimal. Take into consideration wind speed, wind direction, temperature, application equipment and sprayer settings. If this pest control product is to be used on a commodity that may be exported to the U.S. and you require information on acceptable residue levels in the U.S., contact 1-866-375-4648 or www.cropro.org.

Storage: Store in original, tightly closed container. Protect from freezing. Do not ship or store near food, feed, seed and fertilizers. Store in a cool, dry, locked, well ventilated area without a floor drain.

Resistance Management: Headline contains a Group 11 fungicide. Do not exceed the total number of sequential applications of Group 11 fungicides and total number of applications of Group 11 fungicides per season as stated on their labels.

Kumulus DF *(sulfur)*

Group M

Manufacturer: BASF Canada

Formulation: 80% water dispersible granular, 25 kg bag.

Registered Mixes: Polyram DF.

Crops: Greenhouse cucumbers, peas, Saskatoon berries.

Diseases Controlled: Entomosporium leaf and berry spot (saskatoon berries), powdery mildew (cucumbers, peas).

When Used: See *"How to Apply."*

How to Apply:

With: Ground equipment.

Water volume: Peas and cucumbers: Minimum of 40 L/ac. Saskatoon berries: 40 L/ac.

Pressure: 275 - 345 kPa.

Nozzles: Hollow cones or flat fans recommended.

Kumulus DF (cont'd)

Rate:

Crop	Rate	Notes
Greenhouse cucumbers		
powdery mildew	120 g/100 L water	Apply once every 5 days as required.
Peas		
powdery mildew	0.6 kg/ac	Spray at first appearance of disease and repeat at 7 - 10 day intervals as necessary.
Saskatoon berries		
Entomosporium leaf and berry spot	3.0 kg/ac	Apply first at flower bud break and at 10 - 14 day intervals while disease persists.

7. **Application Tips:** Do not apply if temperature is above 27°C (in shade) and high humidity prevails or if any of the aforementioned conditions are expected within 3 days after the treatment. Treat when conditions are such that spray will dry on plants. Do not apply under intense sunshine.
8. **How it Works:** A contact and protectant fungicide/acaricide.
9. **Grazing and Harvest Restrictions:** Do not apply later than 1 day before harvest.
10. **Toxicity:** Acute oral LD_{50} (rats) = 12,400 mg/kg , Acute inhalation LC_{50} (rats) = >5.7 mg/L.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hat, goggles, respirator, unlined nitrile or neoprene gloves and rubber boots.

    If in eyes, flush immediately with flowing water for at least 15 minutes. **If on skin**, wash with soap and water, remove contaminated clothing and launder before reuse. **If swallowed**, give two glasses of water; induce vomiting. **If inhaled**, remove person to fresh air and assist breathing if necessary. In all cases, a **physician or Poison Control Centre should be consulted**.
12. **Storage:** Store in cool, dry, well ventilated locked area without a floor drain.

Lance *(boscalid)*

Group 7

Manufacturer: **BASF Canada**

1. **Formulations:** 70% water dispersible granular (WDG); 2 x 2.83 kg per case.
2. **Registered Mixes:** None.
3. **Crops:** Canola, dry and succulent beans, fababeans, lentil, chickpeas, berries group, bulb vegetables group, carrots, fruiting vegetables (except cucurbits group), grapes, field lettuce (head and leaf), potatoes, stone fruits group and strawberries.
4. **Diseases Controlled:**

Crop*	Disease
Canola	Sclerotinia stem rot (*Sclerotinia sclerotiorum*)
Chickpea and lentil	Ascochyta blight (*Ascochyta* spp.), gray mold (*Botrytis cinerea*), white mold (*Sclerotinia sclerotiorum*)
Dry beans	White mold (*Sclerotinia sclerotiorum*)
Potato	Early blight (*Alternaria solani*)

* Refer to the label for crops not detailed above.

5. When Used:

Canola: Apply at 20 - 50% flowering. Apply a second time 7 - 14 days later up to 50% bloom if disease persists, or weather conditions are favourable for disease development.

Dry beans: Apply at 20 - 50% flowering. Apply a second time 7 - 14 days later if disease persists, or weather conditions are favourable for disease development. Use the higher rate to obtain extended protection and maximum yield benefit.

Chickpea, lentil: Apply at the beginning of flowering. Apply a second time 7 - 14 days later if disease persists, or weather conditions are favourable for disease development.

Potatoes: Apply prior to disease development if conditions are favorable for disease development. Do not apply more than 4 times per season. Do not apply more than 2 consecutive applications before rotating to a different mode of action for at least 1 application.

6. How to Apply:

With:

Ground or aerial application: Canola, dried beans (except soybean), chickpea and lentil.

Ground application only: Succulent beans, lettuce, fruiting vegetables (except cucurbits), potatoes, carrots, bulb vegetables, stone fruits, berries, grapes and strawberries.

Rate:

Canola: 142 g/ac.

Dry beans: 227 - 312 g/ac – use the higher rate to obtain extended protection and maximum yield benefit.

Chickpea, lentil: 170 g/ac.

Potatoes: 70 - 125 g/ac – use the high rate under severe disease conditions.

Water volume:

Aerial application: Minimum of 16 L/ac. Ensure thorough coverage of foliage.

Ground application: Minimum of 40 L/ac.

Pressure: Consult nozzle manufacturers' recommendation for spray pressures for specific nozzles.

7. Application Tips: Clean the spray tank following sprayer clean-up recommendations on the label of the product applied previously. Fill the spray tank 1/2 full with clean water and begin vigorous agitation. Add the specified amount of Lance WDG fungicide to the tank. Continue agitation while filling the tank to the desired volume to obtain the required spray concentration. Maintain vigorous agitation throughout the spraying operation. If spray solution sits in the tank for more than one hour without being sprayed out, make sure it is in solution prior to subsequent application. Do not tank mix with any other products. Good coverage is essential for effective disease control. Any reduction in water volume can reduce disease control.

As with all fungicides, Lance works better if it is applied in a preventative manner and performs best if applied in a regularly scheduled protective spray program. Maximum number of applications per season: canola, dry beans, chickpeas, lentil – 2. Do not apply to any body of water. Avoid drifting of spray onto any body of water or other non-target areas. Specified buffer zones should be observed.

8. How it Works: Due to its protective and curative-eradicative effects, Lance WDG can therefore be applied in either pre- or post-infection situations. However, optimum disease control is achieved when Lance WDG fungicide is applied in a regularly scheduled protective spray program and is used in a rotation program with other fungicides.

Effects of rainfall: Do not apply if rainfall is imminent.

9. Grazing and Harvest Restrictions: All crops can be grazed or fed to livestock.

Preharvest intervals: Canola, dry beans, chickpeas, lentil – 21 days; Potatoes – 30 days. For all other labeled crops, please refer to the label. Do not re-enter treated area for 4 hours after application or until dry.

Crop rotation restrictions: Labelled crops can be planted immediately following application. All other crops can be planted 14 days after the last application.

Lance (cont'd)

10. **Toxicity:** Acute oral LD_{50} (rats) >2,000 mg/kg/bw. Acute dermal LD_{50} (rats) >2,000 mg/kg/bw. Treat symptomatically.
11. **Precautions, First Aid:** Do not take internally – harmful if swallowed. Call a physician or poison control centre immediately. Drink large quantities of water. Do not induce vomiting or give anything by mouth to an unconscious person. Do not get in eyes, causes eye irritation, potential skin sensitizer. Avoid contact with skin and clothing. **Keep out of reach of children.**

    In case of eye contact, flush eyes immediately with flowing water for at least 15 minutes and consult a physician if irritation develops. **In case of skin contact**, wash with soap and water. Remove contaminated clothing and launder separately from household laundry before re-use. Consult a physician if irritation develops. **If inhaled**, remove person to fresh air. Assist breathing if necessary. Consult a physician immediately. Take container, label or product name and pest control product registration number with you when seeking medical attention. Wash thoroughly after handling and before eating, drinking or smoking. Wear long sleeved shirt, long pants, chemical resistant gloves, socks and footwear during mixing/loading, application, cleanup and repair. If clothing becomes contaminated, remove and wash separately from household laundry before reuse. Clean spray equipment thoroughly after use. Do not contaminate domestic or irrigation water, lakes, streams or ponds by the cleaning of equipment or the disposal of wastes. Apply only when the potential for drift to areas of human habitation or areas of human activity such as houses, cottages, schools and recreational areas is minimal. Take into consideration wind speed, wind direction, temperature, application equipment and sprayer settings. If this pest control product is to be used on a commodity that may be exported to the U.S. and you require information on acceptable residue levels in the U.S., contact 1-866-375-4648 or www.cropro.org.
12. **Storage:** Store in original, tightly closed container. Do not ship or store near food, feed, seed and fertilizers. Store in a cool, dry, locked, well ventilated area without a floor drain.
13. **Resistance Management:** Any fungal population may contain individuals naturally resistant to Group 7 fungicides. A gradual or total loss of pest control may occur over time if these fungicides are used repeatedly in the same locations. Appropriate resistance management strategies should be followed.

Parasol WP/FL *(copper hydroxide)*

Group M

Manufacturer: **Nufarm Canada**

1. **Formulations:** Wettable Powder, 50%, 10 kg bags. Flowable, 24.4 %, 2 x 10 L jugs.
2. **Registered Mixes:** Mancozeb.
3. **Crops:** Flowable: Potatoes. Wettable powder: Beans, cucumbers, peppers, potatoes, sugarbeets, tomatoes.
4. **Diseases Controlled:** Bacterial blight (Halo beans, common beans), Cercospora leaf spot (sugarbeets), early blight (potatoes), late blight (potatoes).
5. **When Used:**

    Potatoes: Apply when plants are 15 cm high; apply at 7 - 10 day intervals; Parasol WP or FL may be applied at vine kill with a desiccant or alone after vine kill, prior to harvest.

    Beans: Apply when plants are 15 cm high; repeat at 7 - 14 day intervals.

    Sugarbeets: Begin applications when disease threatens; repeat every 10 - 14 days.

    Cucumbers: Apply weekly once plants begin to vine.

    Tomatoes/peppers: Apply when disease threatens; repeat every 7 - 10 days.

6. **How to Apply:**

Water volume: Enough to ensure complete coverage.

Rate: Use high rates if conditions favour disease or if crop canopy is dense.

Crop	Parasol WP	Parasol FL
Beans	0.9 - 1.3 kg/ac	–
Potatoes	0.45 - 1 kg/ac	0.32 - 0.73 L/ac
Potatoes (vine kill)	1.38 kg/ac	1.0 L/ac
Sugarbeets	0.9 - 1.8 kg/ac	–
Tomatoes	0.7 - 0.9 kg/ac	–

7. **Application Tips:** Continuous agitation is recommended.

8. **How it Works:** A contact fungicide.

9. **Grazing and Harvest Restrictions:** Pre-harvest intervals: All crops can be harvested one day after application.

0. **Toxicity:** Low mammalian toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg.

1. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes. **If swallowed**, seek medical attention. Take labelled container with you. Avoid breathing spray mist.

2. **Storage:** Store in a cool, dry, well ventilated area out of reach of children and animals.

Polyram 16D/Polyram DF

(metiram)

Group M

Manufacturer: BASF Canada

WARNING CORROSIVE

1. **Formulation:** Dry flowable: Polyram DF – 80%; 20 kg bag. Dry flowable: Polyram 16D – 16%; 10 kg box. Polyram 16D is generally used on potato seed treatment; Polyram DF is used as a foliar fungicide.

2. **Registered Mixes:** Benlate 50W, Diazinon, Malathion. Compatible with most commonly used insecticides, adjuvants and fungicides, including Superior Oil Mixtures with Diazinon or Malathion. These should be prepared immediately prior to use and not allowed to stand in the tank. Open bags should be sealed if stored until the following season.

. **Crops:** Potatoes.

. **Diseases Controlled:** Blackleg (potatoes), early blight (potatoes), late blight (potatoes).

. **When Used:** See *"How to Apply."*

. **How to Apply:**

With: Aircraft, ground equipment.

Water volume: Aircraft: 22 L/ac; Ground: 40 - 80 L/ac.

Pressure: 275 - 345 kPa.

Polyram 16D/Polyram DF (cont'd)

Nozzles: Hollow cones or flat fans recommended.

Rate:

Crop/disease	Formulation	Quantity/when to use
Potato (foliar spray)		
Early and late blight	Polyram 16D	4.8 - 5.7 kg/ac. Begin treating when plants are 15 cm high and repeat at 7 - 10 day intervals until tops are killed.
	Polyram DF	At 7 - 10 day intervals 0.45 - 0.71 kg/ac until plants cover the row. Then increase to 0.9 kg/ac until tops are killed or use 0.45 - 0.71 kg/ac at 5 - 7 day intervals starting when plants are 15 cm high and continue until killing. When conditions (rain or dew) favour infections, use the shorter intervals in each case.

7. **Application Tips:** See *"How to Apply."*
8. **How it Works:** A contact and protectant fungicide.
9. **Grazing and Harvest Restrictions:** Do not feed treated forage to livestock. Do not apply when environmental conditions may cause drift from the treatment area. Harvest intervals (days): Carrots (5), celery (14), potatoes (1), sugar beets (21), tomatoes (7).
10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) technical = >10,000 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
    If swallowed, seek medical attention.
12. **Storage:** Store in a cool, dry, ventilated place. Do not allow product to become wet or overheated as this will reduce its effectiveness and may create flammable vapours.

Quadris *(azoxystrobin)*

Group 11

Manufacturer: **Syngenta Crop Protection Canada Inc.**

1. **Formulation:** Flowable; suspension concentrate; azoxystrobin 250 g/L, 4 x 3.78 L
2. **Registered Mixes:** None.
3. **Crops:** Beans (excluding soyabeans), canola, chickpeas, lentils, peas, potatoes, tomatoes.
4. **Diseases Controlled:** Alternaria black spot, Sclerotinia stem rot, virulent blackleg.
5. **When Used:**

    Alternaria black spot: Apply at early pod stage (90% petal drop).

    Sclerotinia stem rot: Apply at early bloom (prior to 30% bloom; this timing will also suppress Alternaria black spot.).

    Virulent blackleg: Apply at the 2 - 6 leaf stage of the canola.

6. **How to Apply:**

With: Aircraft or ground equipment.

Rate: Virulent blackleg and Alternaria black spot: 202 mL/ac. Sclerotinia stem rot: 282 - 404 mL/ac*.

* Use higher rates for fields with Sclerotinia history or crops under severe or prolonged disease conditions, high humidity or excessive rainfall.

Water volume: Aerial application: Minimum of 18 L of water per acre.
Ground application: Sufficient water to ensure thorough coverage of foliage, (at least 40 L/ac). Use sufficient water volumes for good coverage.

Pressure: 275 kPa (40 psi).

Caution: Quadris fungicide has been shown to be extremely phytotoxic to certain apple varieties. Quadris should not be applied where there is the possibility of spray drift reaching apple or crabapple trees. **Do not** use sprayers used to apply Quadris fungicide to spray apples or crabapples.

7. **Application Tips:** Partially fill the spray tank with clean water and begin agitation. Add the specified amount of Quadris to the tank. Finish filling the tank to the desired volume for the required spray concentration; maintain agitation. Maintain agitation throughout the spraying operation. If the spray mixture stands for a prolonged period (i.e. overnight), vigorous agitation may be required to re-suspend the solution.

8. **How it Works:** Quadris fungicide is a broad spectrum, preventative fungicide with systemic properties.

Effects of rainfall: Do not apply if rainfall is imminent.

9. **Grazing and Harvesting Restrictions:** Do not apply within 30 days of harvest.
Plant back intervals (days): Broadleaf and root crops (30); cereals (45).

10. **Toxicity:** Low oral toxicity. Acute oral LD_{50} (rats) = >5,000 mg/kg. This product is unlikely to cause harmful effects under normal conditions of handling and use. No specific symptoms are known for this product. If ingested, nausea, vomiting, diarrhea and abdominal pain may occur. Treat symptomatically.

11. **Precautions, First Aid:** Avoid contact with eyes, skin and clothing. Avoid breathing dust or spray mist. Wash with soap and water after handling and before eating, drinking or smoking. Wash contaminated clothing separately from household laundry before reuse. Do not wear contaminated shoes. Wear long-sleeved shirt, long pants, and chemical resistant gloves when mixing and loading Quadris fungicide as well as during cleanup and repair activities. **Keep out of reach of children**.

Do not contaminate irrigation water, lakes, streams or ponds by cleaning of equipment or disposal of wastes. A 100 metre buffer zone must be observed adjacent to environmentally sensitive areas such as forests, water bodies, wetlands and areas that drain into these habitats. **Do not** apply Quadris fungicide through irrigation equipment.

If on skin, wash with plenty of soap and water. **If in eyes**, flush eyes immediately with clean water for at least 15 minutes and consult a physician. **If swallowed**, induce vomiting. Get medical attention immediately. If patient is unconscious, provide air.

2. **Storage:** Keep in tightly closed original container during storage. Store in cool, dry, well ventilated area away from feed and foodstuffs and out of reach of children and animals. Do not store below 0°C.

3. **Resistance Management:** Quadris fungicide contains a Group 11 fungicide. Any fungal population may contain individuals naturally resistant to Quadris fungicide and other Group 11 fungicides. A gradual or total loss of pest control may occur over time if these fungicides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

Reason 500 SC *(fenamidone)*

Group 11

Manufacturer: **Bayer CropScience**

1. **Formulation:** Flowable; suspension concentrate; 500 g/L fenamidone; 2, 4 or 10 L.
2. **Registered Mixes:** Bravo, Dithane.
3. **Crops:** Potatoes.
4. **Diseases Controlled:** Late blight.
5. **When Used**: Application of Reason 500 SC for control of late blight should begin when plants are 15 - 20 cm high or when disease threatens (whichever comes first). Apply a fungicide having a different mode of action within 7 - 10 days after each application of Reason 500 SC.

   Timing of application: When Reason 500 SC is applied alone, use the shorter spray interval when conditions favor disease development. Under severe disease conditions, it is recommended to use a tank mix of Reason 500 SC with Dithane DG or Bravo 500 and the shorter spray interval. Follow the recommended spray interval for each fungicide application before proceeding with the next application. Do not apply Reason 500 SC, alone or in tank mix, more than 6 times in a year.
6. **How to Apply:**

   With: Ground equipment.

   Rate: 160 ml/ac; 80 mL/ac when tank mixed with Bravo or Dithane.

   Water volume:

   Ground: Minimum 90 L/ac; enough to ensure complete coverage.

   Pressure: Minimum 275 kPa.
7. **Application Tips:** Reason 500 SC should be applied as a preventative disease control measure. Good coverage is essential for effective disease control. Any reduction in water volume can reduce disease control.
8. **How it Works:** Reason 500 SC is a preventative, protectant fungicide, which inhibits spore germination and acts as an anti-sporulant.
9. **Grazing and Harvest Restrictions:** Pre-harvest interval 14 days.
10. **Toxicity:** Oral LD_{50} (rats) fenamidone = 750 mg/kg.
11. **Precautions, First Aid:** **If in eyes**, hold eyelids open and flush with a steady, gentle stream of water for a minimum of 15 minutes. Get medical attention or contact a Poison Control Center. **If swallowed**, have patient drink 1 or 2 glasses of water and induce vomiting by touching the back of the throat with a finger, if patient is conscious. Do not give anything by mouth to an unconscious person. Call a physician or contact a Poison Control Center. **If on skin**, wash with plenty of soap and water. Remove contaminated clothing. **If inhaled**, remove patient from site of exposure. Give supportive care. Seek medical attention immediately if toxicity or irritation persists. Take container, label or product name and pest control product registration number with you when seeking medical attention.
12. **Storage:** Store container in a cool, dry place away from feeds, seeds, fertilizers, plants and foodstuffs. Keep leftover product in original container, tightly closed, in a safe place. Do not use or store in or around the home. Keep away from fire or open flame or other sources of heat. If stored for 1 year or longer, shake well before using. **Cannot be stored below freezing.**

Ridomil Gold/Bravo

(chlorothalonil + metalaxyl)

Group M,4

Manufacturer: **Syngenta Crop Protection Canada Inc.**

WARNING POISON

1. **Formulation:** Liquid; chlorothalonil 500 g/L + metalaxyl 480 g/L; 2 x (0.83 L + 8 L).

2. **Registered Mixes:** None. Do not tank mix with a top killer (crop desiccant).

3. **Crops:** Potatoes.

4. **Diseases Controlled:** Botrytis vine rot, early blight, late blight, late blight tuber rot.
Fungi suppressed: Pythium leak and pink rot.

5. **When Used:** It is recommended that Bravo/Ridomil be used within an Integrated Pest Management Program, (sound seed, field selection and rotation, field monitoring, use program of recommended contact fungicides).

For Botrytis vine rot, early blight, late blight, late blight tuber rot, Pythium leak and pink rot: Apply early in the season when conditions are favorable for disease **(before disease infection)**, but no later that when plant foliage meets within the row uniformly across the field. Apply a second and third application of Ridomil Gold/Bravo at 14-day intervals. The label rate of a registered contact fungicide should be applied 7 days after each Ridomil Gold/Bravo application. Following the last application of Ridomil Gold/Bravo, apply the labelled registered contact fungicide at its recommended timing throughout the reminder of the season.

Note: If applications of Ridomil Gold/Bravo fungicide are made for control of foliar diseases, additional applications of tuber disease control are not needed.

6. **How to Apply:**

With: Aircraft or ground equipment.

Water volume: Ground: Minimum of 91 L water/ac. Air: Minimum of 20 L water/ac.

Pressure: 275 kPa.

Nozzles: Flat fan. Spray screens should be no finer than 50 mesh. For aerial application, adjust nozzles to provide a medium droplet size of 200 - 400 microns. Sprays: Do not let tank contents stand for prolonged periods without agitation.

Rate: One 8.83 L jug will treat 10 acres. Do not attempt to measure from this jug. The entire contents must be added to the spray tank or an improper mixture will result.

7. **Application Tips:** Do not contaminate bodies of water through application sprays, cleanup or runoff. Do not apply when weather conditions favour drift from treated areas. Consult local authorities as to the determination of adequate buffer zones. Not recommended for disease control in greenhouses.

How it Works: Bravo/Ridomil is a combination of a systemic and contact fungicide. It has both preventative and curative activity against fungi of the order Peronosporales – this includes the late blight fungus.

9. **Grazing and Harvest Restrictions:** Do not feed to livestock. Do not make more than 3 applications per season regardless of the disease being treated.

Toxicity: Low acute mammalian toxicity. Acute oral LD_{50} (rats) chlorothalonil = 10,000 mg/kg, metalaxyl = 669 mg/kg.

11. **Precautions, First Aid:** Protect yourself from eye, skin and respiratory exposure. Causes severe eye damage. Wear full protective clothing – long-sleeved shirt, long pants, coveralls, chemical resistant gloves, rubber boots, **goggles** – during mixing, loading, application, cleanup and repair. Wear a respirator, **goggles** or a face shield during mixing and loading.

    In in eyes, flush with plenty of water for 15 minutes and get immediate medical attention. **If on skin**, wash thoroughly with soap and water. Seek medical attention if skin irritation persists. **If inhaled**, move to fresh air and monitor. **If swallowed**, give water or milk and seek immediate medical attention at a Poison Control Centre or medical facility. Do not induce vomiting. There is no specific antidote; treat symptomatically.

    Symptoms of poisoning: Redness of the eyes, mild bronchial irritation, redness or rash on exposed skin areas.
12. **Storage:** Store in a dry, heated area and maintain above 0°C. Keep away from sources of heat. Avoid storage with food or feed.
13. **Resistance Management:** For resistance management, please note that Ridomil Gold/Bravo fungicide contains Group M and Group 4 fungicides. Any fungal population may contain individuals naturally resistant to Ridomil Gold/Bravo fungicide and other Group M and Group 4 fungicides. A gradual or total loss of pest control may occur over time if these fungicides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

Ridomil Gold MZ 68WP

(metalaxyl + mancozeb)

Group 4,M

Manufacturer: **Syngenta Crop Protection Canada Inc.**

WARNING POISON

1. **Formulation:** Wettable powder; 8% metalaxyl + 64% mancozeb; 4% metalaxyl + 64% mancozeb; 6 x 4 kg.
2. **Registered Mixes:** None. Do not tank mix Ridomil MZ with a top-killer (crop desiccant).
3. **Crops:** Lettuce, onions, potatoes.
4. **Diseases Controlled:** Downy mildew in onions and head lettuce, early blight, late blight and late blight tuber rot in potatoes.

    Fungi suppressed: Pink rot and Pythium leak in potatoes.
5. **When Used: Early and late blight on the foliage of potatoes and suppression of Pythium leak and pink rot:** Apply before the outbreak of disease. Apply up to 3 applications in sufficient water to ensure thorough coverage of foliage. Start application early – the first application should be applied before the leaves of the plants touch in the potato row. Apply a second and third application of Ridomil MZ at 10 - 14 day intervals. Apply a contact fungicide recommended for control of late blight 5 - 7 days after each Ridomil MZ application. Following the final Ridomil MZ application, apply a contact fungicide recommended for late blight control at the recommended rate and interval to the end of the season.

    Use limitations: Discontinue use when potato vines start to look mature.

6. **How to Apply:**

   With: Aircraft or ground equipment.

   Rate: 1 kg/ac.

   Water volume:

   Ground: Sufficient water to ensure thorough coverage of foliage.
   Air: Minimum of 20 L of water per acre.

   Pressure: 275 kPa.

   Nozzles: Flat fan. Spray screens should be no finer than 50 mesh. For aerial application, adjust nozzles to provide a medium droplet size of 200 - 400 microns.

   Sprays: Do not let tank contents stand for prolonged periods without agitation. Ensure bypass line discharges at the bottom of the tank to minimize foaming.

7. **Application Tips:** Apply as part of a preventative disease management program. Cultural practices to minimize the sources of disease should be used as well as early preventative applications of fungicides. Under severe late blight conditions, the shorter 10-day interval is recommended. When changing from Ridomil MZ to a contact fungicide, apply within 5 - 7 days of the last Ridomil MZ application. Avoid application when weather conditions favour drift from treated areas.

8. **How it Works:** Ridomil MZ is a combination of a systemic and contact fungicide. It has both preventative and curative activity against fungi of the order Peronosporales – this includes the late blight fungus.

9. **Grazing and Harvest Restrictions:** Do not feed to livestock. Do not apply within 14 days of lettuce harvest or 7 days of onion harvest. Do not make more than 3 applications per season regardless of the disease being treated. Do not re-enter the treated areas within 12 hours.

10. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) mancozeb = 8,000 mg/kg; metalaxyl = 669 mg/kg. In order to minimize risk to the environment from the use of this product, do not use on coarse textured gravelly soils, soils with less than 2% organic matter or in areas where the water table may be high.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the undiluted pesticide (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures. Get medical attention. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Irritation of eyes, skin or respiratory tract; vomiting, diarrhea, apathy, circulatory problems. Some individuals may develop an allergy. Prolonged or repeated overexposure to dust may cause apathy, loss of appetite or weakness.

    For physician: There is no specific antidote for this product. If ingested, induce emesis or initiate gastric lavage. Treat symptomatically.

12. **Storage:** Dry, heated storage above 0°C. Keep away from sources of heat above 40°C. Keep containers closed when not in use.

Ronilan EG *(vinclozolin)*

Group 2

Manufacturer: **BASF Canada**

CAUTION POISON

1. **Formulation:** Extruded granule; 50%;12 kg box (1.2 kg/PVC bag, 2 x 1.2 kg/pouch, 5 x 2.4 kg/pouch per box).
2. **Registered Mixes:** Lorsban 4E, Pyrinex 480EC.
3. **Crops:** Canola, dry beans, strawberries.
4. **Diseases Controlled:** Grey mould (*Botrytis cinerea*), white mould *(Sclerotinia sclerotoirum)* Sclerotinia stem rot *(Sclerotinia sclerotoirum)*.
5. **When Used:**

   Canola: Single application: Apply at early to mid bloom (20 - 50%). This stage will normally be about 4 - 8 days after beginning of flowering. Maximum of 1 application per season. **Split application:** Apply at early to mid bloom (20 - 30%) with a second application 7 days later at late bloom (50%) if the disease persists, or weather conditions are favorable for disease development. Maximum of 2 applications per season.

   Dry common beans: Single application: Apply at early to mid bloom (30 - 50%). Maximum of 1 application per year. **Split application:** Apply at early to mid bloom (30 - 50%) with a second application 7 - 14 days later at full bloom if the disease persists or weather conditions are favorable for disease development. Maximum of 2 applications per season. Do not apply more than 0.8 kg/ac per season.

   Strawberries: The first application should be made no later than 10% primary bloom, and the last application should be before the end of the blooming period. Maximum of 4 applications per season. Do not allow more than 3.2 kg/ac per season.

6. **How to Apply:**

   With: Aircraft or ground equipment.

   Water volume: Air: 16 L/ac. Ground: 45 - 90 L/ac. Strawberries: 405 L/ac.

   Canola: Air or ground.

   Beans, strawberries: Ground only.

   Pressure: 275 kPa. Strawberries: 425 - 850 kPa.

   Rate:

Crop	Disease	g/ac
Canola – single application	Sclerotinia stem rot	300 - 400*
split application		200**
Dry beans	White mold	400 - 600
Strawberries	Grey mold	800

* Use the high rate (400 g/ac) where conditions are extremely favourable for development of disease (heavy crop canopy, high humidity and/or excessive rainfall).

** Apply first application (200 mL/ac) at early bloom (20 - 30%) with a second application (200 mL/ac) 7 days later at full bloom if the disease persists or if weather conditions are favorable for disease development.

7. **Application Tips:** Thorough coverage of plant parts prior to infection is essential for effective disease control. Ensure continuous agitation in the spray tank until the spray solution is sprayed out. Ronilan EG should be applied using standard aerial equipment or ground equipment and practices. When applying by air, treat when wind is less than 8 kilometers per hour. Avoid handling the water soluble bags with wet gloves or placing the bags on wet surfaces.

8. **How it Works:** Ronilan EG is a contact protectant fungicide with some early eradicant properties that will control infections that occurred up to 36 hours prior to application. Contact activity means all the fungicide remains on the petal surfaces where the disease initially develops, and the fungicidal activity is not diluted by movement to other plant tissues that have no impact on the development of Sclerotinia. It acts by preventing the germination of spores and will arrest the development of germinated spores.

   Effects of rainfall: Do not apply if rain is imminent.

9. **Grazing and Harvest Restrictions:** Do not allow livestock to graze on treated plants. **Pre-harvest intervals (days):** Canola (45), dry common beans (40 days), strawberries (3).

Toxicity: Very low mammalian toxicity, LD_{50} (rats) = >5,000 mg/kg.

Warning: Animal studies have demonstrated that the active ingredient in this product can produce adverse effects on the reproductive system and on the developing fetus. Workers, especially women of child-bearing age, should be careful when handling this product. Occupational exposure will be reduced by strict adherence to the handling precautions and use directions provided.

Precautions, First Aid: Refer to label for guidelines on protective clothing.

If in eyes, flush immediately with flowing water for at least 15 minutes and consult a physician if irritation develops. **If on skin**, wash with soap and water. Remove contaminated clothing and launder before reuse. Consult a physician if irritation develops. **If inhaled**, remove person to fresh air. Assist breathing if necessary. Consult a physician immediately. **If swallowed**, give two (2) glasses of water, **induce vomiting** and consult a physician immediately.

Storage: Store in a cool, dry, well ventilated space away from feeds and foods. Freezing will not affect Ronilan EG.

Rovral Flo/Rovral WP *(iprodione)*

Group 2

Manufacturer: **Bayer CropScience**

CAUTION POISON

Formulation: Wettable powder; 50%; 1 kg, 8 kg bags. Flowable; Rovral Flo; 240 g/L; 2 x 8.4 L pack.

Registered Mixes: Addition of 405 g non-ionic wetter is recommended for improved fungicide performance with the wettable powder only.

Crops: Canola, kidney beans, snap beans, white beans.

Diseases Controlled: Alternaria, Botrytis pod rot, Sclerotinia stem rot, Sclerotinia white mold.

When Used:

Kidney and white beans: For control of Sclerotinia white mould: Treatment prior to the presence of disease is preferable; however, Rovral is still effective if applied at the initial sign of infection, when less than 5% of the plants are showing Sclerotinia white mold. Apply when beans are in the 25 - 75% bloom stage. **Snap beans:** For Sclerotinia white mold control: Apply when 50% of the bloom has opened. For Botrytis pod rot control: Apply twice, when 30% and again when 50% of the blooms have opened.

Canola: For control of Sclerotinia stem rot: Apply when crop is in the 20 - 30% bloom stage.

For Argentine varieties, apply when 15 - 20% of the flowers are open (including small pods) on the main stem. For Polish varieties, apply when 11 - 15% of the flowers (or small pods) are open on the main stem.

Rovral Flo/Rovral WP (cont'd)

6. **How to Apply:**

With: Aircraft or ground equipment.

Water volume: Beans 18 L/ac (air); 121 L/ac (ground). Canola 18 L/ac (air); 40 L/ac (ground).

Rate:

Crop	Disease	Roval Flo mL/ac	Roval WP g/ac
Canola – single application	Sclerotinia stem rot	840 - 1,253*	–
	Alternaria (suppression)	840	–
	Alternaria (control)***	840	–
Canola – split application**	Sclerotinia stem rot and Alternaria (suppression)	420 - 630 + 420	–
	Alternaria (control)***	420 + 420	–
Kidney beans, snap beans, white beans	Botrytis and sclerotinia	–	400 - 606

* Higher rate for fields with a history of heavy disease pressure or with dense crop stands.

** Apply first application (420 - 630 mL/ac) at the 20% bloom stage of canola. The use of the higher rate on the first application is recommended for field with a history of sclerotinia disease pressure or dense crop stands. The second application should be made at the 50% bloom stage of canola for sclerotinia control.

*** Control of alternaria requires an application at the early green pod stage. Early green pod stage occurs when almost all the canola pods are fully formed and still green with only a few flowers or underdeveloped pods remaining at the top of the plant.

7. **Application Tips:** When disease is actively growing in beans, the infection may quickly exceed the point where 5% of plants show mold. Spray mixture should be used on the day prepared. Good spray coverage is essential.

8. **How it Works:** Rovral is a protective and eradicant fungicide. Prevents disease infestation during the mid-flowering period and thus protects against major yield losses.

Effects of rainfall: Do not spray in heavy dew or when rain is imminent.

9. **Grazing and Harvest Restrictions:** Observe a pre-harvest interval of 38 days.

10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) iprodione = 3,500 mg/kg. Very low toxicity to bees.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children.**

If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes. A mild eye irritant. **If swallowed**, seek medical attention.

12. **Storage:** Store flowable above 0°C.

Senator 70WP *(thiophanate methyl)*

Group 1

Manufacturer: **Engage Agro Corporation**

1. **Formulation:** Wettable powder 70%; 2 kg.
2. **Registered Mixes:** None.
3. **Crops:** Sugarbeet, white beans.
4. **Diseases Controlled:** Leaf spot, white mold.
5. **When Used: Sugarbeets:** Apply when disease first appears. Repeat 14 - 21 days later if required. **White beans:** Apply when conditions favouring development of disease exists, which usually occurs during early stages of bloom prior to rows closing in. Repeat applications if required.
6. **How to Apply:**

   With: Ground equipment or by air.

   Rate: Sugarbeets: 0.17 - 0.23 kg/ac. **White beans:** 0.71 - 0.91 kg/ac.

   Water volume: White beans: Ground: 404 L/ac; Aerial: 20 - 24 L/ac.
7. **Application Tips:** Reduced control can be expected in fields where volunteers from the previous year's crop act as a source of infection.

   Consult your provincial specialist for recommendations.
8. **How it Works:** Senator 70WP is a systemic fungicide effective against certain fungal diseases.
9. **Grazing and Harvest Restrictions:** Sugarbeet: Do not apply within 21 days of harvest. No sugarbeets or parts of the sugarbeets are to be used as fodder or feed. White beans: Do not feed or allow livestock to graze on treated crops.
10. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) technical = 7,500 mg/kg, Senator (non-toxic).
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children**.

    Do not contaminate domestic or irrigation water supplies, lakes, streams or ponds.

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes. **If swallowed**, seek medical attention.
12. **Storage:** Store in a dry place.
13. **Resistance Management:** For resistance management, please note that Senator 70WP contains a Group 1 fungicide. Any fungal population may contain individuals naturally resistant to Senator 70WP and other Group 1 fungicides. A gradual or total loss of pest control may occur over time if these fungicides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed.

Stratego 250 EC

(trifloxystrobin + propiconazole)

Group 11,3

Manufacturer: **Bayer CropScience**

1. **Formulation:** 125 g/L propiconazole and 125 g/L trifloxystrobin as an EC formulation, 8 L jug.
2. **Registered Mixes:** None.
3. **Crops:** Oats, spring barley, wheat (Canadian prairie, durum, hard red, soft white, winter).
4. **Diseases Controlled: Barley:** Net blotch, scald, Septoria leaf blotch. **Oats:** Crown rust, Septoria leaf blotch. **Wheat:** Leaf and stem rust, powdery mildew, Septoria leaf blotch, stripe rust, tan spot.
5. **When Used:** Apply Stratego 250 EC at the very early stages of disease development. Typically, one application from the beginning of tillering up to flag leaf emergence is required. A second application may be made if needed up to 1/2 emergence of the head. Do not apply second application within 14 days of the first treatment.

   Timing of application: Single application: 4 leaf to 1/2 head emergence. **Two applications:** First application – 4 leaf to flag leaf stage. Second application – up to 1/2 head emergence, but not within 14 days of first application.
6. **How to Apply:**

   With: Aircraft or ground equipment.

   Rate: 200 ml/ac.

   Water volume:

   Ground: 40 - 80 L/ac.

   Aircraft: Minimum of 20 L/ac.

   Pressure: Minimum of 275 kPa by ground.
7. **Application Tips:** Stratego 250 EC should be applied as a preventative disease control measure or at the very early stages of disease development. Established diseases are more difficult to control and may have already reduced crop vigor. Good coverage is essential for effective disease control. Any reduction in water volume can reduce disease control.
8. **How it Works:** Stratego 250 EC is a broad spectrum, foliar fungicide for preventative disease control in cereals.
9. **Grazing and Harvest Restrictions:** Pre-harvest interval (days), grazing (30), grain, hay or straw (45). If 2 applications of Stratego 250EC are applied, do not allow grazing or harvesting of treated crop for forage or hay. Do not apply Stratego 250 EC within 45 days of harvest.
10. **Toxicity:** Oral LD_{50} (rats) = 4,757 mg/kg.
11. **Precautions, First Aid: If in eyes, immediately** rinse eyes with a large amount of running water. Hold eyelids apart to rinse entire surface of the eye and lids. Get medical attention if irritation persists. Do not apply any medicating agents except on the advice of a physician. **If swallowed**, do not induce vomiting. Promptly drink a large quantity of milk, egg whites, or gelatin solution. If these are not available, drink large quantities of water. Never give anything by mouth to an unconscious person. Call physician or Poison Control Center immediately. **If on skin**, wash with plenty of soap and water. Do not apply any medicating agents except on the advice of a physician. In case of poisoning, call a physician or Poison Control Center immediately. Take container, label or product name and pest control product registration number with you when seeking medical attention.
12. **Storage:** Store container in a cool, dry place away from food, drink and animal feedstuffs. Keep leftover product in original container, tightly closed, in a safe place. **Protect from freezing.**

Tattoo C *(propamocarbhydrochloride + chlorothalonil)*

Group U,M

Manufacturer: **Bayer CropScience**

DANGER CORROSIVE

1. **Formulation:** Suspension concentrate; 375 g/L Propamocarb HCl + 375 g/L Chlorothalonil; 10 L jug.
2. **Registered Mixes:** None.
3. **Crops:** Potatoes.
4. **Diseases Controlled:** Late blight.
5. **When Used:** Use a maximum of 3 applications of Tattoo C per growing season as a foliar spray in a preventative program for control of late blight in potatoes. Begin applications when conditions are favorable for disease, but before infection, and continue on 7 - 14 day intervals until the threat of disease is over. Use the 7-day interval when the risk and conditions for disease are high. When applying Tattoo C on the longer spray interval (10 - 14 days), alternate with an application of a contact fungicide midway between Tattoo C applications.
6. **How to Apply:**

   With: Ground equipment.

   Rate: 1.1 L/ac.

   Water volume: Apply in 80 - 120 L of water per acre. Ensure thorough coverage of the potato foliage.

   Sprays: Do not allow spray mixture to remain in tank overnight or for long periods during the day without agitation.

   Mixing instructions: Add one-half of the required amount of water to the spray or mixing tank and start agitation. Add the required quantity of Tattoo C to the water and complete filling with water. Maintain agitation throughout spraying.
7. **Application Tips:** Thorough spray coverage of all plant material (particularly lower stems) is essential to attain optimum systemic activity. If multiple fungicide applications are required, rotation with other fungicide products is recommended. Where possible, Tattoo C should be applied in alternation with a fungicide having a different mode of action. Treatments with any product containing chlorothalonil must be separated by a minimum of 7 days.
8. **How it Works:** Tattoo C is a fungicide that combines the systemic action of propamocarb hydrochloride with the contact activity of chlorothalonil to give protection against late blight of potatoes. Propamocarb hydrochloride only moves upward in the potato plant, so it is essential to ensure coverage of the lower portions of the plant.
9. **Grazing and Harvest Restrictions:** Do not apply within 7 days of harvest. Do not feed treated crops to livestock.
10. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) propamocarb hydrochloride = 2,000 - 8,550 mg/kg; chlorothalonil = 4,200 mg/kg.
11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children.**

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes. **If swallowed**, seek medical attention.

Tattoo C (cont'd)

Precaution: Do not re-enter treated areas within 48 hours after treatment. If required, individuals may re-enter treated areas within 48 hours for short-term tasks not involving hand labour provided that 4 hours have passed since application and that long pants and a long-sleeved shirt are worn.

For physician: Probable mucosal damage may contraindicate the use of gastric lavage. Medical personnel should contact Aventis Crop Science's Hazard Information Services at 1-800-228-5635, ext. 201.

12. **Storage:** Cannot be stored below freezing. Keep away from fire or open flame or other sources of heat. If stored for 1 year or longer, shake well before using.

Tilt 250E *(propiconazole)*

Group 3

Manufacturer: **Syngenta Crop Protection Canada Inc.**

CAUTION POISON

1. **Formulation:** Emulsifiable concentrate; 250 g/L; 2 x 5 L jugs; 4 x 5 L jugs.
2. **Registered Mixes:** In wheat and barley only: 2,4-D Amine, MCPA Amine, Buctril M, Pardner. In wheat, barley and oats: Liquid nitrogen (at 4.05 kg/ac or less), Matador.
3. **Crops:** Barley, Canada prairie spring wheat, canary seed, canola, dry beans, durum wheat, hard red spring wheat, oats, soft white spring wheat, soybean, winter wheat.
4. **Diseases Controlled:**

Barley	Wheat	Oat	Canola
leaf rust	glume blotch	aerial web blight	blackleg
net blotch	leaf rust	crown rust	
powdery mildew	powdery mildew	frogeye leaf spot	
scald	Septoria leaf spot	rust	
Septoria leaf spot	stem rust	Septoria leaf blotch	
spot blotch	stripe rust	soybean	
stem rust	tan spot		

Diseases suppressed: Septoria leaf mottle in canary seed.

5. **When Used:**

Barley, oats and wheat: Apply at a very early stage of disease development, anytime from the beginning of stem elongation to before the head is half emerged. Best results have been achieved when Tilt is applied just as the flag leaf emerges. Conditions that favour a good crop are often the same conditions that favour leaf diseases.

Canola: Apply Tilt during the rosette stage (between 2nd true leaf and bolting). Tilt will control blackleg and enhance yield potential during the early stages of canola growth.

Canary seed: Apply at emergence to flag leaf stage (ground application only).

Note: Tilt should be applied as a preventative disease control measure. Established diseases are more difficult to control and may have already reduced crop vigour.

6. **How to Apply:**

With: Aircraft or ground equipment.

Rate: 202 mL/ac.

Water volume: 80 L/ac (ground); 16 L/ac - 20 L/ac (air).

Pressure: 275 kPa.

Nozzles: Flat fan (ground); flat fan or hollow cone (air).

7. **Application Tips:** Good coverage is essential for effective disease control. Any reduction in water volume can reduce disease control.

8. **How it Works:** Partially systemic, Tilt is transported upwards in plants. Tilt has both preventative and curative activity. Length of control will vary from 3 - 4 weeks depending on disease, crop and environmental conditions. Strongly absorbed by most soils. Studies show that Tilt remains in the upper layers of the soil and very little to no leaching occurs.

   Effects of rainfall: If rainfall occurs within 1 hour of application, re-application is necessary.

9. **Grazing and Harvest Restrictions:** Do not graze animals on treated green crops within 3 days of application. Last application must be made prior to 45 days before harvest in cereals and 60 days before harvest in canola. Straw from cereals can be fed to livestock provided no tank mix was used.

10. **Toxicity:** Low acute mammalian toxicity. Acute oral LD_{50} (rats) technical = 1,517 mg/kg, Tilt = 2,105 mg/kg. Toxic to fish.

11. **Precautions, First Aid:** Protect yourself by reducing skin and eye exposure. Wear coveralls, brimmed hard hat, goggles, respirator, unlined nitrile or neoprene gloves and neoprene overboots or rubber boots. In addition, wear a waterproof apron when handling the pesticide concentrate (see page 27 for further information). Follow directions for *Cleaning of Clothes and Equipment* (see page 29) before reuse. **Keep out of reach of children.**

    If in eyes or on skin, use standard first aid measures. Get medical attention immediately for eyes.
    If swallowed, seek medical attention.

    Symptoms of poisoning: Irritation of eyes or skin can result from overexposure. Prolonged or repeated inhalation may cause headache, dizziness or nausea.

    For physician: There is no specific antidote for this product.

12. **Storage:** Heated storage only.

13. **Resistance Management:** Tilt 250E fungicide contains a Group 3 fungicide. Any fungal population may contain individuals naturally resistant to Tilt 250E fungicide and other Group 3 fungicides. A gradual or total lost of pest of control may occur over time if these fungicides are used repeatedly in the same fields. Other resistance mechanisms that are not linked to site of action but specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance management strategies should be followed.

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Chemical Control of Rodents

Introduction

Rodent problems are usually related to or are a product of human cultural practices. Understanding how to modify certain activities and situations will help prevent or reduce problems with rodents. For example, pastures should not be overgrazed as this practice encourages the proliferation of ground squirrels. Mouse problems can be prevented or drastically reduced, especially in buildings, by eliminating their food sources and areas of shelter. Rotational cropping with weed control will prevent the establishment of significant gopher populations. However, not all rodent problems can be corrected by management or cultural changes.

Chemical control, combined with management and cultural modifications, is often required to eliminate established rodent populations and to prevent their recurrence. This section contains information on chemicals used to control or repel woodchucks, ground squirrels, mice, pocket gophers, hares and rabbits.

Secondary poisoning describes poisoning that results when one animal consumes another that has been poisoned with a toxicant, and it, in turn, is killed. When using baits, farmers must check their success on a regular basis (every day is advisable). Dead rodents above ground should be picked up and removed to prevent the possibility of secondary poisoning of wildlife and dogs. Where there is evidence of secondary poisoning, the poisoning program should be stopped immediately and re-evaluated. Dead rodents should be buried deep enough so that scavenging animals can't dig them up.

Marketing Classification

Each rodenticide or rodent repellent is classified according to the use for which it is intended. The categories are **Domestic**, **Commercial** or **Restricted**.

A product classified as **Domestic** allows consumers to use it in and around their homes.

A **Commercial** product can be used by persons engaged in a commercial activity, such as a farmer, on land they own or control. Commercial pest control personnel may use this category product within commercial establishments (i.e. restaurants, hotels and food stores).

Restricted products are extremely hazardous. Therefore, their use is more limited and controlled. These products may be hazardous because of their inherent toxicity or intended use in environmentally sensitive areas. For example, strychnine requires the distributor to record the users' name, address, land location, intended use and signature at the time of sale.

Anticoagulants *(bromodialone, chlorophacinone, difethialone, diphacinone, warfarin, warfarin + ergocalciferol, warfarin + sulfaquinoxaline)*

Manufacturer: **Numerous Manufacturers**

DANGER POISON

1. Formulations:

Formulation	Active ingredient (AI)	Concentration (AI)	Container sizes
Bait block	Brodifacoum, bromodialone, chlorophacinone, diphacinone	0.025%, 0.005%	50 g - 15 kg
	difethialone	0.0025%	10 kg
Dust or powder	Warfarin	0.5%	100 g
Extruded pellets	Brodifacoum, bromodialone, chlorophacinone, diphacinone	0.005%	50 g - 20 kg
	Warfarin	0.025%	50 g - 9 kg
	Sulfaquinoxaline + warfarin	0.025% + 0.025%	500 g - 1 kg
Particulate	Bromodialone, chlorophacinone	0.005%	20 g - 20 kg
	Ergocalciferol + warfarin	0.025% + 0.1%	500 g, 10 kg
	Warfarin	0.025%	454 g - 20 kg
	Sulfaquinoxaline	0.025% + 0.025%	500 g - 10 kg
Sodium salt of Diphacinone	Diphacinone	0.106%	50 mL
Soluble granules	Warfarin	0.5%, 1.5%	11.3 g
Solution	Chlorophacinone	0.28%, 0.07%	250 mL, 1 L
Wholegrain	Diphacinone	0.005%	250 gm
	Warfarin	0.025%	340 - 450 gm

Note: Brodifacoum and bromodialone are single-feeding anticoagulants; all others are multiple-feeding anticoagulants.

2. Marketing Category: Commercial, domestic.

3. Registered Uses:

	Products							
	Brodifacoum	Bromodialone	Chlorophacinone	Difethialone	Diphacinone	Warfarin (W)	W + Calciferol	W + Sulfaquinoxaline
Mice and voles								
Farm buildings	X	X	X	X	X	X	X	X
Food service areas		X	X		X	X	X	X
Fruit trees, ornamentals, vines			X		X	X		X
Garbage dumps	X	X	X	X	X	X		X
Grainaries (empty)	X		X	X	X	X	X	X
Human dwellings	X	X	X	X	X	X	X	X
Nurseries			X		X			X
Orchards			X		X			X
Outdoor living areas (parks, playgrounds)			X					X
Sewers		X			X	X		
Storage buildings	X	X	X	X	X	X	X	X
Woodlands			X		X			

Ground squirrels and pocket gophers: Chlorophacinone and dipachinone in farmyards, forage/field crops, gardens, nurseries, pasture/rangeland, residential areas, turf.

4. Animals Controlled: Ground squirrels, mice, pocket gophers, voles (field mice), Norway rats.

5. When Used:

Ground squirrels: Springtime, prior to vegetation regrowth, may provide better results; late summer and post-harvest for best control.

Mice, Norway rats, voles: Best results when used after removal of other food sources.

Pocket gophers: Use in early spring before "green-up" or late fall for best results.

6. How to Apply:

With: For ground squirrels, baits can be placed in a bait station or into burrows and covered. For pocket gophers, apply bait into burrow by hand probe or with use of tractor-drawn applicator. Apply for mice and voles within a bait station. Weatherproof baits may be broadcast outside but must be under cover (i.e. balestack, grainbin, etc.) in late fall to control mouse and vole damage to nursery stock, ornamentals and shelterbelts.

Anticoagulants (cont'd)

Rate:

Bait station	**Animal**	**Formulation**
500 g/station every 30 - 60 m of infested area depending on animal density	Ground squirrel	Pellets, liquid concentrate on grain, grain bait
15 - 50 g/protected station at intervals of 2 - 3 m	Mice, voles	Meal, pellets, dust/powder, liquid concentrate
1 or 2 blocks/station at intervals of 2 - 3 m	Mice, voles	Bait blocks
One 11.3 g packet/L of water in chick fountain or shallow dish near feeding sites	Mice	Soluble granules
Pour 100 mL of solution into shallow dish near feeding sites	Mice	Solution

Note: Bait station should be designed to keep bait dry, contained from windblow or animal scattering as well as safe from livestock, birds and other non-targets.

Burrows		
15 - 20 g/burrow entrance	Ground squirrel	Pellets, liquid concentrate on grain, grain bait
15 - 20 g/burrow or 120 - 240 g/ac with tractor-drawn applicator	Pocket gopher	Pellets, grain bait

Number of applications:

Mice and voles: Brodifacoum and bromodialone: 1 usually effective. Can be re-applied after 1 week if rodents still present. All other anticoagulants: maintain uninterrupted supply of bait until feeding and rodent activity ceases.

7. **Application Tips:**

Bait station: Only place bait in areas accessible to target animals in secure bait stations that cannot be overturned or broken into by children, pets, wild or domestic animals.

Burrows: Place ground squirrel bait far into each burrow opening with long spoon. This placement makes the bait inaccessible to non-target animals. Ensure equipment used to apply pocket gopher bait is in good repair and adjusted or calibrated properly before use. Monitor use closely.

8. **How it Works:**

Anticoagulant poisons: Interfere with clotting of blood and cause damage to tiny blood vessels. They prevent formation of prothrombin by competition with vitamin K. Rate of blood clotting is gradually reduced and the animal bleeds to death.

Calciferol: Mobilizes calcium and causes death from organ calcification and heart attack.

Sulfaquinoxaline: Is an antibacterial agent that increases the effectiveness of warfarin by inhibiting intestinal bacteria that produce vitamin K.

9. **Expected Results:** Rodents usually begin to die 3 - 4 days after they ingest anticoagulants.
10. **Effects of Rainfall:** Can result in deterioration and molding of exposed bait. Extended rainfall will also effect field rodent activities, reducing bait uptake.
11. **Movement in Soil:** None.
12. **Grazing and Cropping Restrictions:** Do not use ground squirrel bait stations in areas accessible to livestock or pets.
13. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) brodifacoum = 0.27 mg/kg, bromodialone = 1.12 mg/kg, chlorophacinone = 5.0 mg/kg, diphacinone = 2 - 3 mg/kg, warfarin = 50 - 100 mg/kg. Potentially toxic to birds and other animals.

14. **Precautions, First Aid:** Label bait stations **"Poison."** Wear gloves. Wash hands after use. Pick up and dispose of dead rodents to prevent secondary poisoning of scavengers. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures (see page 32). **If swallowed**, seek medical attention.

    Symptoms of poisoning: Pallor and weakness from blood loss, bloody nose and feces, internal bleeding, swelling and discolouration from blood in tissue.
15. **Storage:** Store in locked room or container. Do not store with other pesticides or chemicals; rodents are very taste and odor sensitive and will be repelled by contaminated bait. Keep bait in original container.

Acute Poisons

Bromethalin

Manufactures: PM Resources Inc. (Engage Agro Corporation)

1. **Formulation:** 0.01% Bromethalin, packaged in 30 x 14 g place packs.
2. **Marketing Category:** Commercial. For licensed pest control operators only.
3. **Registered Uses:** For use in and around homes, industrial and agricultural buildings and similar man-made structures. Cannot be used in sewers. Bait must be placed in tamper-resistant bait stations (see label for additional information).
4. **Animals Controlled:** House mice, Norway rats, roof rats.
5. **When Used:** Begin placing bait stations as soon as the presence of rodents are noticed.

   House mice: For the 14 gram size, apply 3 place packs per placement. Tamper-resistant bait stations should be spaced at 2.4 - 3.7 meter intervals, in locations out of each of children, pets, domestic animals and non-target wildlife. The number and locations of bait stations should be recorded.

   Norway and roof rats: For the 14 gram size, apply 3 - 12 place packs per placement. Adjust the amount applied to the level of rat feeding expected at each bait placement. Tamper-resistant bait stations should be spaced at 6.0 to 9.0 meter intervals, in locations out of reach of children, pets, domestic animals and non-target wildlife. The number and locations of bait stations should be recorded.
6. **Application Tips:** The bait is not to be placed outdoors, in areas near farm wells and water reservoirs or in areas where there is a possibility of contaminating sources of drinking water. Place directly in tamper-resistant bait stations; DO NOT open place packs. Highest bait consumption is expected to occur on the first day or two after treatment. After several days, inspect the tamper-resistant bait stations and replenish bait at sites where there is heavy feeding. Although one night's feeding will usually provide a lethal dose, maintain bait for at least a week to provide all rodents a chance to feed on the bait. Baiting should be continued until all signs of feeding have ceased. Where a continuous source of infestation is present, establish permanent bait stations and replenish bait as needed.
7. **How it Works:** Bromethalin acts as a neurotoxin in target rodents, controlling via the nervous system of rats and mice. Bromethalin, with its unique mode of activity, also controls populations of rats and mice resistant to anticoagulant-based baits.
8. **Expected Results:** Reduction in number of rodents. Poor results can occur in the following situations: if directions for use are not followed, rates are reduced and bait is not replenished regularly in bait stations.

9. **Effects of Rainfall:** None, since bait is placed in tamper-resistant bait stations.
10. **Movement in Soil:** None, since bait is placed in tamper-resistant bait stations.
11. **Grazing and Cropping Restrictions:** None, not for use in fields.
12. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = 13 mg/kg. Toxic to humans, domestic animals and non-target wildlife.
13. **Precautions, First Aid:** Wear gloves when setting or collecting bait packs. Do not enhance bait by adding flavour or bait attractants.

    If in eyes or on skin, flush eyes or skin with water and wash clothing. **If swallowed**, seek medical attention immediately, if breathing difficulty occurs or if irritation persists.
14. **Storage and Disposal:** Store in a cool, dry place away from other chemicals in a secure location inaccessible to children and non-target animals.

Quintox/Rampage

[cholecalciferol (Vitamin D3)]

Manufacturer: **Kem San/A.P.A.**

DANGER POISON

1. **Formulations:** Extruded pellets: 0.075%; 50 x 30 g place pack, 8 x 30 g boxes, 5.5 lb pail. Treated seed: 0.075%; 10 g place packs, 5 lb pail.
2. **Marketing Category:** Domestic.
3. **Registered Uses:** Dwellings, farm buildings, field/forage crops, grainary bins (empty), pasture/range land, processing plants (non-food), service establishments (non-food), storage areas (non-food).
4. **Animals Controlled:** Mice, pocket gophers, Richardson's ground squirrels, voles (meadow mice).
5. **When Used:** Any time of year.

   Number of applications: Maintain uninterrupted supply of bait until feeding ceases. If reinfestation occurs, repeat treatment. If a continuous problem exists, establish permanent bait stations and replenish bait as required.

   Ground squirrel: Springtime, prior to vegetation re-growth, may provide best results. In dry years, baiting may be successful throughout the summer and fall. Follow label instructions; re-bait open burrows next day.

   Pocket gophers: Hand treatment – One application can be effective. Re-bait active burrow systems up to 14 days following the initial treatment. To locate tunnel, use a narrow gauge metal rod and probe at the mound where the plug is located or probe in-line between two fresh dirt mounds. Introduce bait into tunnel by removing clod of soil with a spade or garden trowel. Carefully seal entry point with dirt after bait is placed. Use pocket gopher traps where poison has not removed gophers.
6. **How to Apply:** Place 1 bait pack at 2 - 3 m intervals in infested area or place up to 20 g in covered bait stations at 2 - 3 m intervals in the problem area.
7. **Application Tips:** Remove alternative food sources, and reduce mouse shelter as much as possible prior to bait use. Place bait where mice will find it, such as along walls, near gnawed openings, beside burrows or generally where mice or their signs (i.e. droppings, tracks) are noticed. Protect bait from rain, snow or other moisture. Replace old, stale bait. Keep fresh bait out until feeding ceases.
8. **How it Works:** Cholecalciferol mobilizes calcium from the bones of affected rodents into the bloodstream. This action causes hypercalcemia and death from heart failure. Feeding stops once a lethal dose is consumed. Less than 3 g of consumed bait is sufficient to kill a mouse.

9. **Expected Results:** A lethal dose can be consumed by a mouse in one feeding, but usually this dosage level occurs after several smaller feedings over several days. Death results 2 - 4 days after a lethal dose is consumed.
10. **Effects of Rainfall:** Rain, snow or other moisture will cause deterioration and molding of bait and will result in poor bait acceptance by mice.
11. **Movement in Soil:** None.
12. **Grazing and Cropping Restrictions:** None. Not for outside use. Do not allow pets access to bait.
13. **Toxicity:** High mammalian toxicity. Acute oral LD$_{50}$ (rats) 100% concentration = 43.6 mg/kg. Low dermal and oral toxicity for birds. No secondary hazards exist.
14. **Precautions, First Aid:** Label bait stations **"Poison."** Wear gloves. Wash hands after use. **Keep out of reach of children, domestic animals and pets**.

    If in eyes or on skin, use standard first aid measures (see page 32). **If swallowed**, seek medical attention.

    Symptoms of poisoning: Hypercalcemia.
15. **Storage:** Store under lock and key in original containers. Do not store with other pesticides or chemicals; rodents are very odor and taste sensitive and will be repelled by contaminated bait.

Strychnine

Manufacturer: **Elston Equipment Co. Inc./K-9 Cattle Company/Saskem/NuGro/Maxim/Wilco**

DANGER POISON

1. **Formulations:** Pellet: 0.35%; 454 g jar, 2.27 kg bag, 18.2 kg bag. Grain: 0.40%; 4.5 kg bag, 25 kg bag. Granular: 0.40%.
2. **Marketing Category:** Restricted. A record of the user's name, address, land location and signature must be kept by distributors.
3. **Registered Uses:** Field/forage crops, pasture/rangeland.
4. **Animals Controlled:** Ground squirrels and northern pocket gopher.
5. **When Used:** Springtime, prior to vegetation regrowth, may provide better results; late summer or early fall for best results following harvest or heavy frost damage to vegetation.

    Number of applications:

    Ground squirrel: One application usually effective. Rebait active burrows a second time. Use traps or pyrotechnics if second application fails, especially in small areas (i.e. <2 acres).

    Pocket gopher: Hand treatment: one application often effective. Rebait active burrows up to 14 days following initial treatment. If burrow builder is used, rebait active burrows by hand treatment at each active burrow. Use pocket gopher traps where poison has not removed gophers.

    Rate: Follow directions on label. For ground squirrel, place 5 mL of bait into each burrow entrance. For pocket gopher, place 5 mL into tunnel near fresh dirt mounds or apply 0.12 - 0.24 kg/ac of bait with tractor-drawn applicator.
6. **Application Tips:**

    Ground squirrel: Place bait far into most active tunnel with long-handled spoon and cover burrow entrance so as not to cover bait. Remove dead rodents to prevent poisoning of scavenging animals.

    Pocket gopher: Use commercial hand probe or metal rod to locate tunnel. Begin probing in-line between two fresh dirt mounds. Carefully seal entry point with dirt after bait is placed.

Strychnine (cont'd)

7. **How it Works:** Enters bloodstream and interferes with the central nervous system. Symptoms appear within 5 - 30 minutes after ingestion. Convulsions lead to death from respiratory failure.
8. **Expected Results:** Reduction in rodent numbers in control area. **Poor results may occur if** directions for use are not carefully followed or if poor quality, stale or contaminated bait is used. Store rodent baits away from chemicals or other strong odours.
9. **Effects of Rainfall:** None if bait applied according to label instructions and bait placed well into the burrow.
10. **Movement in Soil:** None.
11. **Grazing and Cropping Restrictions:** None if used according to label instructions and bait is not spilled above ground. Precautionary measures should be taken to prevent non-target poisoning.
12. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = 12 mg/kg. Lethal dose to man 30 - 60 mg/kg. Toxic to birds, cattle and other animals.
13. **Precautions, First Aid:** Wear gloves. Wash hands after use. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures (see page 32). **If swallowed**, seek medical attention immediately.

    Symptoms of poisoning: Frequent convulsions with intervals of quiescent periods. Body stiffens and arches, breathing stops.
14. **Storage:** Keep bait sealed in containers they were purchased in. Do not re-package or distribute to other containers. Keep under lock and key and in a warm, dry place. Do not freeze.

Zinc Phosphide

Manufacturer: Sanox/A.P.A./United Agri Products

DANGER POISON

1. **Formulations:** Extruded pellet, cracked bait: 2.0%; 1.36 kg bottle, 6 x 454 g pack, 20 kg bag, 22.7 kg bag.
2. **Marketing Category:** Commercial.
3. **Registered Uses:**

    Ground squirrels, pocket gophers: Outside use only around farm buildings (ground squirrel only), farmyards, field/forage crops, gardens, nurseries, pasture/rangeland, residential areas, turf.

    Mice, voles: Outside use only around dwellings, farm buildings, farmyards, orchards, storage areas.
4. **Animals Controlled:** Ground squirrels, mice, pocket gophers, voles.
5. **When Used:**

    Ground squirrels, pocket gophers: Springtime, prior to vegetation regrowth, may provide better results; late summer to post-harvest for best control.

    Mice, voles: Apply in orchards prior to snowfall and before leaf fall and lodging of grass. Use outdoors within bait stations according to label and as necessary.

    Number of applications:

    Ground squirrels: One usually. Plug all burrows after treatment, rebait opened burrows next day.

    Mice, voles: Outside, maintain uninterrupted supply until feeding ceases. Outside, re-apply after 2 weeks if mice still present (i.e. droppings, chewing, etc.).

    Pocket gophers: Re-apply after 10 days where rodents still active.

6. **How to Apply:**

   With: Bait stations, burrow builder, cyclone seeder, hand baiting, tractor-drawn burrow applicator for pocket gophers.

   Rate:

   Ground squirrels: Place 5 g far into each burrow with a spoon, or place continual supply in protected bait station until rodents are controlled.

   Mice, voles: Outside areas, place 5 g in protected bait stations every 2 - 4 m. Outdoor areas, apply with cyclone spreader at 405 g - 1.6 kg/ac. Apply 15 g around trees. If hazard to other animals exists, place 15 g of bait in protected bait stations every 2 - 4 m.

   Pocket gophers: 5 g of bait into burrow using commercial or home-made probe. Apply with burrow builder at .3 - .6 kg of bait/hectare.

7. **Application Tips:**

   Ground squirrel: Do not apply on bare ground. Never place bait in unprotected heaps or piles.

   Pocket gopher: For hand baiting, treat near fresh soil mounds. Plug probe hole after applying bait.

8. **How it Works:** On contact with dilute acids of the stomach, phosphine is released. Death results from asphyxia.

9. **Expected Results:** Reduction or elimination of rodent population.

10. **Effects of Rainfall:** Exposed bait can become neutralized and ineffective within several days. Pellets should be used to prevent rapid breakdown of toxicity.

11. **Movement in Soil:** None, breaks down rapidly to phosphine.

12. **Grazing and Cropping Restrictions:** Use in a manner to prevent access to livestock, pets and non-target wildlife. Only use outside of buildings.

13. **Toxicity:** High acute mammalian toxicity. Acute oral LD_{50} (rats) = 27 mg/kg. Toxic to all birds and other animals.

14. **Precautions, First Aid:** Wear gloves. Wash hands after use. Keep unused bait in original container. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures (see page 32). **If swallowed**, seek medical attention.

    Symptoms of poisoning: Nausea, vomiting (black vomitus with smell of phosphine), abdominal pain, chest tightness, excitement and cold sensations.

5. **Storage:** Do not store with other chemicals or pesticides, as the bait will become contaminated. Store under lock and key. Store bait in original container. Keep away from moisture.

Gaseous Oxides of Sulphur

(gas cartridges)

Manufacturer: **Apache Seed Co./Sanex**

DANGER POISON

1. **Formulations:** Granular solid within cardboard cylinder; major ingredients – sodium nitrate, charcoal, sulphur (contains various components depending on manufacturer); 75 - 85 g/cylinder, 3 cylinder package.
2. **Marketing Category:** Domestic.
3. **Registered Uses:** Farmyards, field/forage crops, gardens, nurseries, orchards, outdoor living areas, pasture/rangeland, turf.
4. **Animals Controlled:** Ground squirrels, pocket gophers, woodchucks.
5. **When Used:** Spring through fall when rodents are active and causing damage.
6. **How to Apply:** Place fuse in a sulphur oxide cartridge, light fuse and insert cartridge as far as possible into rodent burrow. When cartridge begins to burn, plug burrow with soil to prevent smoke from escaping.

   Rate: One cartridge/rodent burrow is usually sufficient.
7. **Application Tips:** During gasing operation, watch for smoke exiting nearby burrows and plug these also.
8. **How it Works:** As a cartridge ignites, smoke and toxic gases are produced and fill the rodents' burrow. Rodents breathe toxic fumes and are asphyxiated.
9. **Expected Results:** Asphixiation of rodents in treated burrows. **Poor results may be expected if** cartridges are used to control pocket gophers and ground squirrels that have extensive burrow systems. All areas of an extensive burrow system will not be penetrated by toxic gases from a cartridge. These areas provide a retreat for inhabiting rodents. Rodents may also plug burrow runways to block off toxic fumes.
10. **Effects of Rainfall:** None.
11. **Movement in Soil:** None.
12. **Grazing and Cropping Restrictions:** None.
13. **Toxicity:** High acute mammalian toxicity in enclosed area. 1,000 mg/kg of carbon monoxide, a major product of combustion, causes death.
14. **Precautions, First Aid:** Wear gloves. Avoid prolonged breathing of fumes. Do not use under wooden buildings or flammable material. **Keep out of reach of children**.

    If inhaled, remove victim to fresh air and keep him lying down. If breathing has stopped, apply artificial respiration. Get medical attention promptly.

    Symptoms of poisoning: Same as carbon monoxide. Tightness across forehead, headache, throbbing at the temples, dizziness, weariness, nausea, vomiting, collapse and unconsiousness.
15. **Storage:** Store in cool, dry place as cartridges will absorb water. Keep under lock and key away from combustion source.

Ro-pel *(denatonium benzoate)*

Manufacturer: **Sharp**

1. **Formulations:** Liquid: 0.065%; 946 mL spray bottle, 3.78 L bottles, 18.9 L, 207.8 L drums.
2. **Marketing Category:** Commercial, domestic.
3. **Registered Uses:** Nursery stock, ornamentals.

   Note: Never mix with other chemicals. Use full strength.
4. **Animals Controlled:** Beavers, ground squirrels, hares, mice, porcupines, rabbits, voles, woodchucks.
5. **When Used:** Spring to fall. Before damage is caused or to prevent further damage. A second application may be necessary on new vegetation growth.
6. **How to Apply:** Apply to areas of damage or on areas normally damaged by rodents. **Do not apply to edible parts of trees or plants**.

   With: Brush or sprayer.

   Rate: Generously apply to all surfaces to be protected until completely wet. Apply second coat for extra protection.
7. **Application Tips:** Allow first treatment to dry before re-applying. Do not apply on windy or rainy days. Application on dry surfaces is preferable. Although this product is not toxic to plants or trees, do not use on diseased specimens.
8. **How it Works:** A taste repellant. Attempts by rodents to eat or chew on treated areas results in a bitter taste.
9. **Expected Results:** Prevention of rodent damage to treated areas of plants. **Poor results may be expected if** plants improperly treated or improper amount applied.
10. **Effects of Rainfall:** Do not apply when raining or if rain is forecast. Rain will wash product from treated areas.
11. **Movement in Soil:** None.
12. **Grazing and Cropping Restrictions:** Do not apply to edible parts of crops or plants, fruit or nuts.
13. **Toxicity:** Very low acute mammalian toxicity. Acute oral LD_{50} (rats) = >1,500 mg/kg. Non-toxic to plant and animal life.
14. **Precautions, First Aid:** Avoid contact with eyes, skin, food and clothing. Wear impervious rubber gloves. Wash hands after use. Do not smoke or eat while applying. **Keep out of reach of children**.

    If in eyes, flush with plenty of water for at least 15 minutes and get medical attention. **If on skin**, wash first with isoropyl or ethyl alcohol, then soap and water. If an irritation develops and persists, get medical attention. **If swallowed**, seek medical attention.

    Symptoms of poisoning: Unknown.
15. **Storage:** Store in cool, dry area under lock and key. Do not store near food, feed or fertilizers. Keep product in original container.

Thiram

Manufacturer: **Wilson Laboratories Inc.**

WARNING POISON

1. **Formulations:** 120 g/L suspension; 12 x 500 mL bottle, 4 x 4 L case, 4 L container.
2. **Marketing Category:** Commercial, domestic.
3. **Registered Uses:** Fruit trees, nursery stock, orchards, woody ornamentals.

   Note: Do not mix with other pesticides.
4. **Animals Controlled:** Hares, mice, rabbits, voles.
5. **When Used:**

   Mice and voles: Coat the base of trees or shrubs thoroughly any time during the late fall.

   Rabbits and hares: Before snowfall, treat areas of trees or shrubs accessible to rabbits or hares, even after heavy snow accumulation. **Apply at temperatures above 4°C**.
6. **How to Apply:** Product can be sprayed or brushed on. In the case of planting stock, plants can be dipped.

   With: Paint brush, sprayer.

   Rate:

   Brushing: Thoroughly apply undiluted product with paint brush on areas of potential or occuring damage.

   Dipping: When planting, dip the tops of young trees or plants into undiluted product.

   Spraying: Mix product with equal volume of water. Apply to point of runoff.
7. **Application Tips:** Use immediately after being mixed with water. Keep container tightly closed to prevent evaporation.
8. **How it Works:** A taste repellant. Rodents are discouraged from feeding on vegetation treated with this product.
9. **Expected Results:** Prevention of rodent damage to areas treated.
10. **Effects of Rainfall:** Heavy rains can wash part of the product off the treatment site. Do not apply if raining or if threat of rain exists.
11. **Movement in Soil:** None.
12. **Grazing and Cropping Restrictions:** Do not apply to plant parts used for food or feed.
13. **Toxicity:** Moderate acute mammalian toxicity. Acute oral LD_{50} (rats) = 780 - 865 mg/kg. Skin contact or inhalation may cause irritation of the nose, throat or skin and may induce an allergic reaction.
14. **Precautions, First Aid:** Wash thoroughly after handling. Wash contaminated clothes with soap and water before reuse. Do not consume alcohol immediately before or within 24 hours after use of Thiram. Avoid breathing spray mist. Wash contaminated clothing with soap and water before wearing. **Keep out of reach of children**.

    If in eyes or on skin, use standard first aid measures (see page 32). **If swallowed**, seek medical attention.

    Symptoms of poisoning: Nausea, vomiting, diarrhea, anorexia, hyperactivity and hypothermia.
15. **Storage:** Store in a cool, dry, ventilated place away from feeds and food. Store above 0°C.

Herbicide Selector Chart – Cereals

Crop	American Nightshade	Annual Smartweed		Annual Sow-thistle		Barnyard Grass
Barley	Achieve Liquid Gold Badge Buctril M Koril Mecoprop Mextrol Pardner Thumper	Achieve Liquid Gold Ally Attain Badge Banvel II & Mixes Buctril M Caliber 400[1] Champion Extra Champion Plus Cobutox 600[1] Crossfire Curtail M Dichlorprop-D DyVel DyVel DS 2,4-D Embutox 625[1] Estaprop Hoe-Grass II Lorox	MCPA Amine[1] MCPA Ester[1] MCPA K-salt MCPA Na-salt Mextrol Pardner Prestige Prevail Refine Extra SEE 2,4-DB[1] SEE Diphenoprop SEE MCPA[1] Sencor Spectrum Stampede EDF & Mixes Sword Target Thumper Turboprop Unity	Ally[1] Attain[1] Clovitox Plus[1] Crossfire[1] Curtail M Dichlorprop-D DyVel[1] DyVel DS 2,4-D[1] Estaprop[1] Frontline	Glyphosate* (pre-harvest) MCPA[1] Prestige Prevail Refine Extra[1] SEE Diphenoprop Spectrum Sword Target Topside[1] Tropotox Plus[1] Turboprop[1]	Achieve Liquid Advance 10G Bonanza Champion Extra Hoe-Grass II Hoe-Grass 284 Linuron 480 Lorox Puma ^{120} Super Rival 10G Treflan QR5
Wheat (C - CLEARFIELD wheat)	Achieve Liquid Gold Badge Buctril M Koril Mextrol Pardner Thumper	Achieve Liquid Gold Ally Attain Badge Banvel II & Mixes Basagran[2] Buctril M Caliber 400[1] Cobutox 600[1] Crossfire[2] Curtail M Dichlorprop-D DyVel DyVel DS 2,4-D Embutox 625[1] Estaprop Frontline Frontline 2,4-D Harmony Total Hoe-Grass II K-2	Koril Laser DF[3] MCPA Amine[1] MCPA Ester[1] MCPA K-salt MCPA Na-salt Mextrol Pardner Prestige[2] Prevail Refine Extra SEE 2,4-DB[1] SEE Diphenoprop SEE MCPA[1] Sencor Spectrum Stampede EDF & Mixes Sword Target Thumper Triumph Plus Turboprop Unity	Adrenalin (C) Ally[1] Attain[1] Badge[1] Buctril M[1] Clovitox Plus[1] Crossfire[1,2] Curtail M Dichlorprop-D DyVel[1] DyVel DS 2,4-D[1] Estaprop[1] Frontline Frontline 2,4-D Glyphosate* (pre-harvest)	Harmony Total[1] K-2[1] Koril[2] MCPA[1] Mextrol[1] Prestige[2] Prevail Refine Extra[1] SEE Diphenoprop Spectrum Sword Target Topside[1] Tropotox Plus[1] Turboprop[1]	Achieve Liquid Advance 10G Bonanza Heritage (fallow year) Hoe-Grass II Hoe-Grass 284 Linuron 480 Lorox Puma ^{120} Super Sundance[1]
Oats	Badge Buctril M Koril Mextrol Pardner	Badge Banvel II & Mixes Buctril M Caliber 400[1] Clovitox Plus Cobutox 600[1] Curtail M DyVel Embutox 625[1] Frontline Koril MCPA Amine[1] MCPA Ester[1]	MCPA K-salt MCPA Na-salt Mextrol Refine Extra SEE 2,4-DB[1] SEE MCPA[1] Spectrum Stampede EDF & Mixes Sword Target Topside Tropotox Plus	Clovitox Plus[1] Curtail M DyVel[1] DyVel DS Frontline Glyphosate* (pre-harvest)	MCPA[1] Refine Extra[1] Spectrum Sword Target Topside[1] Tropotox Plus[1]	Linuron 480 Lorox
Fall Rye (spring application)	Badge Buctril M Koril Mextrol Pardner	Badge Buctril M 2,4-D Koril MCPA Amine[1] MCPA Ester[1]	MCPA K-salt MCPA Na-salt Mextrol Pardner SEE MCPA[1]	Clovitox Plus[1] 2,4-D[1] MCPA[1]	Topside[1] Tropotox Plus[1]	Achieve Liquid Hoe-Grass 284
Triticale	Koril Pardner	Hoe-Grass II Koril	Pardner			Hoe-Grass II Hoe-Grass 284

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[1] Suppression only

[2] All spring wheat except durum

[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)

[4] See page 42 for resistance information

[5] Top growth control

Herbicide Selector Chart – Cereals

Crop	Black Nightshade	Bluebur	Canada Thistle		Cleavers	Common Chickweed[4]	Common Groundsel
Barley	Badge Buctril M Koril Mecoprop Mextrol Pardner	Achieve Liquid Gold Ally Attain Badge Buctril M 2,4-D Dichlorprop-D Estaprop MCPA Mextrol SEE Diphenoprop Stampede EDF & Mixes Thumper Turboprop	Achieve Liquid Gold Ally[1] Attain[1] Badge[1] Banvel II & Mixes Buctril M[1] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Compitox[1] Crossfire[5] Curtail M Dichlorprop-D DyVel[1] DyVel DS[1] 2,4-D[1] Embutox 625[1] Estaprop[1]	Express Pack[5] Frontline[1] Glyphosate* (pre-harvest) Lontrel MCPA[1] Mecoprop[1] Mextrol[1] Prevail Refine Extra[5] SEE 2,4-DB[1] SEE Diphenoprop[1] Spectrum Sword[1] Target[1] Topside[1] Tropotox Plus[1] Turboprop[1]	Attain Banvel II[1] Compitox DyVel[1] DyVel DS[1] Frontline Mecoprop Prestige Refine Extra[1] Spectrum Sword Target Unity	Advance 10G Ally Attain[1] Bonanza Champion Extra Champion Plus Compitox Crossfire Linuron 480 Lorox Mecoprop Refine Extra Rival 10G Sencor Spectrum Stampede EDF & Refine Extra Treflan QR5 Unity	Achieve Liquid Gold Ally Badge Buctril M Champion Extra Curtail M Hoe-Grass II Koril Mextrol Pardner Prestige Prevail Refine Extra Sencor Thumper
Wheat (C - CLEARFIELD wheat)	Badge Buctril M Koril Mextrol Pardner	Achieve Liquid Gold Adrenalin (C) Ally Attain Badge Buctril M 2,4-D Dichlorprop-D Estaprop MCPA Mextrol SEE Diphenoprop Stampede EDF & Mixes Thumper Turboprop	Achieve Liquid Gold Adrenalin[5] (C) Ally[1] Attain[1] Badge[1] Banvel II[1] & Mixes Buctril M[1] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Compitox[1] Crossfire[5,2] Curtail M Dichlorprop-D DyVel[1] DyVel DS[1] 2,4-D[1] Embutox 625[1] Estaprop[1] Express Pack[5]	Frontline[1] Glyphosate* (pre-harvest) Horizon[1] K-2[1] Lontrel MCPA[1] Mecoprop[1] Mextrol[1] Prevail Refine Extra[5] SEE 2,4-DB[1] SEE Diphenoprop[1] Spectrum Sword[1] Target[1] Topside[1] Triumph Plus[1] Tropotox Plus[1] Turboprop[1]	Adrenalin[1] (C) Attain Banvel II[1] Basagran[2] Compitox DyVel[1] DyVel DS[1] Frontline Frontline 2,4-D K-2[1] Mecoprop Prestige[2] Refine Extra[1] Spectrum Sundance Sword Target Unity	Adrenalin[1] (C) Ally Attain[1] Basagran[2] Compitox Crossfire[2] Frontline 2,4-D Harmony Total K-2 Linuron 480 Lorox Mecoprop Refine Extra Sencor Spectrum Stampede EDF & Refine Extra Sundance Triumph Plus[2] Unity	Achieve Liquid Gold Adrenalin[1] (C) Ally Badge Basagran[2] Buctril M Curtail M Hoe-Grass II K-2 Koril Mextrol Pardner Prestige[2] Prevail Refine Extra Sencor Thumper
Oats	Badge Buctril M Koril Mextrol Pardner	Badge Buctril M MCPA Mextrol Stampede EDF & Mixes	Badge[1] Banvel II[1] & Mixes Buctril M[1] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Compitox[1] DyVel[1] Embutox 625[1] Frontline[1] Glyphosate* (pre-harvest)	Lontrel MCPA[1] Mecoprop[1] Mextrol[1] Refine Extra[5] SEE 2,4-DB[1] Spectrum Sword[1] Target[1] Topside[1] Tropotox Plus[1]	Banvel II[1] Compitox DyVel[1] Frontline Mecoprop Mecoturf Refine Extra[1] Spectrum Sword Target	Compitox Linuron 480 Lorox Mecoprop Refine Extra Spectrum Stampede EDF & Refine Extra	Badge Buctril M Curtail M Mextrol Pardner
Fall Rye (spring application)	Badge Buctril M Koril Mextrol Pardner	Badge Buctril M 2,4-D MCPA Mextrol	Badge[1] Buctril M[1] Clovitox Plus[1] 2,4-D[1]	MCPA[1] Mextrol[1] Topside[1] Tropotox Plus[1]			Badge Buctril M Koril Mextrol Pardner
Triticale	Koril Pardner						Hoe-Grass II Pardner

[1] Suppression only
[2] All spring wheat except durum
[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)
[4] See page 42 for resistance information
[5] Top growth control

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Cereals

Crop	Corn Spurry	Cow Cockle		Creeping Buttercup	Dandelion	Field Bindweed	Field Horsetail
Barley	Ally Banvel II & Mixes Champion Extra Champion Plus Compitox Crossfire DyVel DyVel DS Mecoprop Refine Extra Sencor Sword Target	Achieve Liquid Gold Advance 10G Ally Badge Banvel II & Mixes Bonanza Buctril M Champion Extra Champion Plus DyVel DyVel DS Express Pack	Frontline[6] Hoe-Grass II Koril Mextrol Pardner Refine Extra Rival 10G Sword Target Thumper Treflan QR5 Unity	Clovitox Plus[1] Compitox 2,4-D[1] Mecoprop Topside[1] Tropotox Plus[1]	Attain Cobutox 600[1] Caliber 400[1] Curtail M 2,4-D[1] Embutox 625[1] Glyphosate[4] (pre-harvest) MCPA Amine[1] MCPA Ester[1] MCPA K-salt Prestige Prevail SEE 2,4-DB[1] SEE MCPA[1] Spectrum[6]	Attain[1] Caliber 400[1] Cobutox 600[1] 2,4-D[1] Clovitox Plus[1] DyVel DS[1] Embutox 625[1] MCPA[1] SEE 2,4-DB[1] Sword Target[1] Topside[1] Tropotox Plus[1]	Attain[5] Caliber 400[1] Champion Plus[5] Clovitox Plus Cobutox 600[1] 2,4-D[1] Embutox 625[1] MCPA[1] SEE 2,4-DB[1] Topside Tropotox Plus
Wheat (C - CLEARFIELD wheat)	Ally Banvel II & Mixes Basagran[2] Compitox Crossfire[2] DyVel DyVel DS Harmony Total K-2 Linuron 480 Lorox Mecoprop Refine Extra Sencor Sword Target Triumph Plus[2]	Achieve Liquid Gold Adrenalin (C) Advance 10G (fallow year) Ally Badge Banvel II & Mixes Bonanza Buctril M DyVel DyVel DS Express Pack Frontline[6]	Harmony Total Heritage (fallow year) Hoe-Grass II K-2 Koril Mextrol Pardner Refine Extra Sword Target Thumper Triumph Plus[2] Unity	Adrenalin[5] (C) Basagran[2] Clovitox Plus[1] Compitox 2,4-D[1] Mecoprop Topside[1] Tropotox Plus[1]	Adrenalin[1] (C) Attain Caliber 400[1] Cobutox 600[1] Curtail M[6] Frontline 2,4-D[1,6] Embutox 625[1] Glyphosate[4] (pre-harvest) MCPA Amine[1] MCPA Ester[1] MCPA K-salt Prestige[2] Prevail SEE 2,4-DB[1] SEE MCPA[1] Spectrum[6] Sundance[1]	Adrenalin[5] (C) Attain[1] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] 2,4-D[1] DyVel DS[1] Embutox 625[1] MCPA[1] SEE 2,4-DB Sword[1] Target[1] Topside[1] Tropotox Plus[1]	Attain[5] Caliber 400[1] Clovitox Plus Cobutox 600[1] 2,4-D[1] Embutox 625[1] MCPA[1] SEE 2,4-DB[1] Topside Triumph Plus[1,2] Tropotox Plus
Oats	Banvel II & Mixes Compitox DyVel Linuron 480 Lorox Mecoprop Refine Extra Reglone Sword Target	Badge Banvel II & Mixes Buctril M DyVel Frontline[6] Koril	Mextrol Pardner Refine Extra Sword Target	Clovitox Plus[1] Compitox Mecoprop Topside[1] Tropotox Plus[1]	Caliber 400[1] Cobutox 600[1] Curtail M Embutox 625[1] Glyphosate[4] (pre-harvest) MCPA Amine[1] MCPA Ester[1] MCPA K-salt SEE 2,4-DB[1] SEE MCPA[1] Spectrum	Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Embutox 625[1] MCPA[1] SEE 2,4-DB Sword[1] Target[1] Topside[1] Tropotox Plus[1]	Caliber[1] Clovitox Plus Cobutox 600[1] Embutox 625[1] MCPA[1] SEE 2,4-DB[1] Topside Tropotox Plus
Fall Rye (spring application)	MCPA K-salt	Badge Buctril M Koril	Mextrol Pardner	Clovitox Plus[1] 2,4-D[1] Topside[1] Tropotox Plus[1]	2,4-D[1] MCPA Amine[1] MCPA Ester[1] MCPA K-salt SEE MCPA[1]	Clovitox Plus[1] 2,4-D[1] MCPA[1] Topside[1] Tropotox Plus[1]	Clovitox Plus 2,4-D[1] MCPA[1] Topside Tropotox Plus
Triticale		Hoe-Grass II Koril	Pardner				

[1] Suppression only
[2] All spring wheat except durum
[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)
[4] See page 42 for resistance information
[5] Top growth control
[6] Spring rosettes only

Herbicide Selector Chart – Cereals

Crop	Flixweed		Foxtail Barley	Green Foxtail[4]	Hairy Nightshade	Hemp-nettle	Knawel
Barley	Achieve Liquid Gold Ally Attain Badge Banvel II & Mixes Buctril M Champion Extra Champion Plus Curtail M Dichlorprop-D DyVel DyVel DS 2,4-D Estaprop Express Pack	Frontline MCPA Mextrol Prestige Prevail SEE Diphenoprop Sencor Spectrum Stampede EDF & Mixes Sword Target Thumper Turboprop Unity		Achieve Liquid Achieve Liquid Gold Advance 10G Bonanza Champion Extra Champion Plus Fortress Hoe-Grass II Hoe-Grass 284 Prevail Puma^{120} Super Rival 500 Stampede EDF Treflan	Badge Buctril M Koril Mecoprop Mextrol	Ally Attain[1] Banvel II & Mixes Champion Extra Champion Plus Clovitox Plus[1] Crossfire DyVel Frontline MCPA[1] Refine Extra Sencor Spectrum Sword Target Topside[1] Tropotox Plus[1] Unity	Hoe-Grass II Koril Pardner
Wheat (C - CLEARFIELD wheat)	Achieve Liquid Gold Adrenalin (C) Ally Attain Badge Banvel II & Mixes Buctril M Curtail M 2,4-D Dichlorprop-D DyVel DyVel DS Estaprop Express Pack Frontline	Frontline 2,4-D K-2 MCPA Mextrol Prestige[2] SEE Diphenoprop Sencor Spectrum Stampede EDF & Mixes Sword Target Thumper Triumph Plus[2] Turboprop Unity	Sundance	Achieve Liquid Achieve Liquid Gold Adrenalin (C) Advance 10G Bonanza Everest Fortress Heritage Hoe-Grass II Hoe-Grass 284 Horizon Horizon BTM K-2[6] Prevail Puma^{120} Super Rival 500 Stampede EDF Sundance[1] Treflan Triumph Plus[2]	Badge Basagran[2] Buctril M Koril Mextrol	Ally Attain[1] Banvel II & Mixes Clovitox Plus[1] Crossfire[2] DyVel Frontline Frontline 2,4-D Harmony Total K-2 MCPA[1] Refine Extra Sencor Spectrum Sword Target Topside[1] Triumph Plus[2] Tropotox Plus[1] Unity	Hoe-Grass II Koril Pardner
Oats	Badge Banvel II & Mixes Buctril M Curtail M DyVel Frontline MCPA	Mextrol Spectrum Stampede EDF & Mixes Sword Target		Stampede EDF	Badge Buctril M Koril Mextrol	Banvel II & Mixes Clovitox Plus DyVel Frontline MCPA[1] Refine Extra Spectrum Target Topside Tropotox Plus	Koril Pardner
Fall Rye (spring application)	Badge Buctril M 2,4-D	MCPA Mextrol		Achieve Liquid Achieve Liquid Gold Hoe-Grass 284	Badge Buctril M Koril Mextrol	Clovitox Pus MCPA[1] Topside Tropotox Plus	Koril Pardner
Triticale				Achieve Liquid Hoe-Grass II Hoe-Grass 284	Koril		Hoe-Grass II Pardner

[1] Suppression only
[2] All spring wheat except durum
[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)
[4] See page 42 for resistance information
[5] Top growth control
[6] Including Group 1 and Group 3 resistant green foxtail

Herbicide Selector Chart – Cereals

Crop	Knotweed	Kochia[4]		Lamb's-quarters		Leafy Spurge
Barley	Advance 10G Bonanza DyVel DS Rival 10G Sword Target Treflan	Achieve Liquid Gold Ally Attain Badge Banvel II & Mixes Buctril M Champion Extra Champion Plus Curtail M[1] 2,4-D Dichlorprop-D DyVel DyVel DS Estaprop Express Pack Hoe-Grass II Koril	MCPA Amine MCPA Ester MCPA K-salt Mextrol Pardner Prestige Prevail Refine Extra SEE Diphenoprop SEE MCPA Stampede EDF & Mixes Sword Target Thumper Turboprop Unity	Achieve Liquid Gold Advance 10G Ally[1] Attain Badge Banvel II & Mixes Bonanza Buctril M Caliber 400 Champion Extra Champion Plus Clovitox Plus Cobutox 600 Crossfire Curtail M 2,4-D Dichlorprop-D DyVel DyVel DS Embutox 625 Estaprop Express Pack Frontline	Hoe-Grass II Koril Linuron 480 Lorox MCPA Mextrol Pardner Prestige Prevail Refine Extra Rival 10G SEE 2,4-DB SEE Diphenoprop Sencor Spectrum Stampede EDF & Mixes Sword Target Thumper Topside Tropotox Plus Treflan QR5 Turboprop Unity	Attain[1] 2,4-D[1] MCPA[1]
Wheat (C – CLEARFIELD wheat)	Adrenalin[1] (C) DyVel DS Sword Target	Achieve Liquid Gold Ally Attain Badge Banvel II & Mixes Buctril M Curtail M[1] 2,4-D Dichlorprop-D DyVel DyVel DS Estaprop Express Pack Frontline 2,4-D Harmony Total Hoe-Grass II K-2 Koril	MCPA Amine MCPA Ester MCPA K-salt Mextrol Pardner Prestige[2] Prevail Refine Extra SEE Diphenoprop SEE MCPA Stampede EDF & Mixes Sword Target Thumper Triumph Plus[2] Turboprop Unity	Achieve Liquid Gold Adrenalin (C) Ally[1] Attain Badge Banvel II & Mixes Basagran[2] Buctril M Caliber 400 Clovitox Plus Cobutox 600 Crossfire[2] Curtail M 2,4-D Dichlorprop-D DyVel DyVel DS Frontline Frontline 2,4-D Embutox 625 Estaprop Express Pack Harmony Total Heritage	Hoe-Grass II K-2 Koril Linuron 480 Lorox MCPA Mextrol Pardner Prestige[2] Prevail Refine Extra Rival 10G (fallow year) SEE 2,4-DB SEE Diphenoprop 600 Sencor Spectrum Stampede EDF & Mixes Sword Target Thumper Topside Triumph Plus[2] Tropotox Plus Turboprop Unity	Adrenalin[1] (C) Attain[1] 2,4-D[1] MCPA[1]
Oats	Sword Target	Badge Banvel II & Mixes Buctril M Curtail M[1] DyVel Koril MCPA Amine MCPA Ester MCPA K-salt	Mextrol Pardner Refine Extra SEE MCPA Stampede EDF & Mixes Sword Target	Badge Banvel II & Mixes Buctril M Caliber 400 Clovitox Plus Cobutox 600 Curtail M DyVel Embutox 625 Frontline Linuron 480 Lorox	MCPA Mextrol Pardner Refine Extra SEE 2,4-DB Spectrum Stampede EDF & Mixes Sword Target Topside Tropotox Plus	MCPA[1]
Fall Rye (spring application)		Badge Buctril M 2,4-D Koril MCPA Amine	MCPA Ester MCPA K-salt Mextrol Pardner SEE MCPA	Badge Buctril M Clovitox Plus 2,4-D MCPA	Mextrol Pardner Topside Tropotox Plus	2,4-D[1] MCPA[1]
Triticale		Hoe-Grass II Pardner		Hoe-Grass II Pardner		

[1] Suppression only

[2] All spring wheat except durum

[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)

[4] See page 42 for resistance information

[5] Top growth control

Herbicide Selector Chart – Cereals

Crop	Narrow-leaved Hawk's-beard	Night-flowering Catchfly	Perennial Sow-thistle		Persian Darnel	Prostrate Pigweed
Barley	Caliber 400 Champion Extra Cobutox 600 2,4-D[1] Embutox 625 Express Pack Refine Extra SEE 2,4-DB Stampede EDF & Mixes	Achieve Liquid Gold Badge Buctril M Dichlorprop-D Estaprop Hoe-Grass II Mextrol Pardner SEE Diphenoprop Sencor Sword Target Turboprop	Achieve Liquid Gold[1] Ally[1] Attain[1] Badge[1] Banvel II[1] & Mixes Buctril M[1] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Curtail M Dichlorprop-D DyVel[1] 2,4-D[1] Embutox 625[1] Estaprop[1] Frontline	Glyphosate* (pre-harvest) Lontrel[1] MCPA[1] Mextrol[1] Prestige Prevail Refine Extra[1] SEE 2,4-DB[1] SEE Diphenoprop Spectrum Sword Target Topside[1] Tropotox Plus[1] Turboprop[1]	Achieve Liquid Achieve Liquid Gold Advance 10G Bonanza Hoe-Grass II Hoe-Grass 284 Prevail Rival 10G Treflan QR5	Advance 10G Ally Banvel II & Mixes Bonanza 2,4-D DyVel DyVel DS MCPA K-salt Rival 10G Sword Target Treflan QR5
Wheat (C - CLEARFIELD wheat)	Ally Caliber 400 Cobutox 600 2,4-D[1] Embutox 625 Express Pack K-2 Refine Extra SEE 2,4-DB Stampede EDF & Mixes	Achieve Liquid Gold Badge Buctril M Dichlorprop-D Estaprop Hoe-Grass II Mextrol Sencor SEE Diphenoprop Sword Target Turboprop	Achieve Liquid Gold[1] Adrenalin[5] (C) Ally[1] Attain[1] Badge[1] Banvel II[1] & Mixes Buctril M[1] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Curtail M Dichlorprop-D DyVel[1] 2,4-D[1] Embutox 625[1] Estaprop[1] Frontline Frontline 2,4-D[5] Glyphosate* (pre-harvest)	Harmony Total[1] Horizon[1] K-2[1] Koril[2] Lontrel[1] MCPA[1] Mextrol[1] Prestige[2] Prevail Refine Extra[1] SEE 2,-4DB[1] SEE Diphenoprop Spectrum Sundance[1] Sword Target Topside[1] Tropotox Plus[1] Turboprop[1]	Achieve Liquid Achieve Liquid Gold Advance 10G (fallow year) Heritage (fallow year) Hoe-Grass II Hoe-Grass 284 Prevail	Adrenalin[1] (C) Ally Banvel II & Mixes 2,4-D DyVel DyVel DS MCPA K-salt Sword Target
Oats	Caliber 400 Cobutox 600 Embutox 625 SEE 2,4-DB Stampede EDF & Mixes	Badge Buctril M Koril Mextrol Pardner Sword Target	Badge[1] Banvel II[1] & Mixes Buctril M[1] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Curtail M DyVel[1] Embutox 625[1] Frontline Glyphosate* (pre-harvest)	Lontrel[1] MCPA[1] Mextrol[1] Refine Extra[1] SEE 2,4-DB[1] Spectrum Sword Target Topside[1] Tropotox Plus[1]		Banvel II & Mixes DyVel MCPA K-salt Sword Target
Fall Rye (spring application)	2,4-D[1]	Badge Buctril M Mextrol Pardner	Badge[1] Buctril M[1] Clovitox Plus[1] 2,4-D[1] MCPA[1]	MCPA K-salt Mextrol[1] Topside[1] Tropotox Plus[1]	Achieve Liquid Hoe-Grass 284	2,4-D MCPA K-salt
Triticale		Hoe-Grass II			Achieve Liquid Hoe-Grass II Hoe-Grass 284	

[1] Suppression only
[2] All spring wheat except durum
[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)
[4] See page 42 for resistance information
[5] Top growth control
[6] Including CLEARFIELD canola when applied with 2,4-D Amine

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Cereals

Crop	Quack Grass	Ragweed		Redroot Pigweed		
Barley	Glyphosate* (pre-harvest)	Achieve Liquid Gold Attain Badge Banvel II & Mixes Buctril M Caliber 400 Clovitox Plus Cobutox 600 Champion Plus 2,4-D Dichlorprop-D DyVel DyVel DS	Embutox 625 Estaprop Koril MCPA Mextrol Pardner SEE 2,4-DB SEE Diphenoprop Sword Target Thumper Topside Tropotox Plus Turboprop	Achieve Liquid Gold Advance 10G Ally Attain Badge Banvel II & Mixes Buctril M Caliber 400 Champion Extra Champion Plus Clovitox Plus Cobutox 600 Curtail M 2,4-D Dichlorprop-D DyVel	DyVel DS Embutox 625 Estaprop Express Pack Frontline Hoe-Grass II Koril MCPA Amine MCPA Ester[1] MCPA K-salt MCPA Na-salt Mextrol Pardner Prestige Prevail Refine Extra	Rival 10G SEE 2,4-DB SEE Diphenoprop SEE MCPA[1] Sencor Spectrum Stampede EDF Sword Target Thumper Topside Treflan QR5 Trifluralin 10G Tropotox Plus Turboprop Unity
Wheat **(C - CLEARFIELD wheat)**	Sundance[1] Glyphosate* (pre-harvest)	Achieve Liquid Gold Adrenalin (C) Attain Badge Banvel II & Mixes Basagran[2] Buctril M Caliber 400 Clovitox Plus Cobutox 600 Dichlorprop-D DyVel DyVel DS 2,4-D Embutox 625 Estaprop	Frontline 2,4-D K-2 Koril Laser DF[3] Linuron 480 Mextrol Pardner SEE 2,4-DB SEE Diphenoprop Sword Target Thumper Topside Triumph Plus[2] Tropotox Plus Turboprop	Achieve Liquid Gold Adrenalin (C) Advance 10G (fallow year) Ally Attain Badge Banvel II & Mixes Buctril M Caliber 400 Clovitox Plus Cobutox 600 Curtail M 2,4-D Dichlorprop-D DyVel DyVel DS	Embutox 625 Estaprop Express Pack Frontline Frontline 2,4-D Harmony Total Heritage (fallow year) K-2 Koril Laser DF[3] MCPA Amine MCPA Ester[1] MCPA K-salt MCPA Na-salt Mextrol Pardner Prestige[2]	Prevail Refine Extra SEE 2,4-DB SEE Diphenoprop SEE MCPA[1] Sencor Spectrum Stampede EDF Sundance Sword Target Thumper Topside Triumph Plus[2] Tropotox Plus Turboprop Unity
Oats	Glyphosate* (pre-harvest)	Badge Banvel II & Mixes Buctril M Caliber 400 Clovitox Plus Cobutox 600 DyVel Embutox 625	Koril MCPA Mextrol Pardner Sword Target Topside Tropotox Plus	Badge Banvel II & Mixes Buctril M Caliber 400 Clovitox Plus Cobutox 600 Curtail M DyVel Embutox 625	Frontline Koril MCPA Amine MCPA Ester[1] MCPA K-salt MCPA Na-salt Mextrol Pardner Refine Extra	SEE 2,4-DB SEE MCPA[1] Spectrum Stampede EDF Sword Target Topside Tropotox Plus
Fall Rye (spring application)		Clovitox Plus 2,4-D Koril MCPA	Pardner Topside Tropotox Plus	Badge Buctril M Clovitox Plus 2,4-D MCPA Amine	MCPA Ester[1] MCPA K-salt MCPA Na-salt Mextrol	Pardner SEE MCPA Topside Tropotox Plus
Triticale				Hoe-Grass II Pardner		

[1] Suppression only
[2] All spring wheat except durum
[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)
[4] See page 42 for resistance information
[5] Top growth control

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Cereals

Crop	Russian Pigweed	Russian Thistle[4]		Scentless Chamomile	Shepherd's-purse	
Barley	Banvel II & Mixes Champion Plus Curtail M 2,4-D Dichlorprop-D DyVel Estaprop Express Pack MCPA Prestige Prevail Refine Extra SEE Diphenoprop Stampede EDF & Mixes Turboprop	Achieve Liquid Gold Ally[1] Attain Badge Banvel II & Mixes Bonanza Buctril M Champion Extra Champion Plus 2,4-D Dichlorprop-D DyVel DyVel DS	Estaprop Express Pack Hoe-Grass II Koril Mextrol Pardner Refine Extra Rival 10G SEE Diphenoprop Sencor Sword Target Thumper Turboprop	Achieve Liquid Gold Ally Badge Buctril M Curtail M Hoe-Grass II Lontrel Mextrol Prestige Prevail Refine Extra	Achieve Liquid Gold Ally Attain Badge Banvel II & Mixes Buctril M Caliber 400 Champion Extra Champion Plus Clovitox Plus Cobutox 600 Curtail M Dichlorprop-D DyVel DyVel DS 2,4-D Embutox 625 Estaprop	Express Pack Frontline MCPA Mextrol Prestige Prevail Refine Extra SEE 2,4-DB SEE Diphenoprop Spectrum Stampede EDF & Mixes Sword Target Thumper Topside Tropotox Plus Turboprop Unity
Wheat (C - CLEARFIELD wheat)	Adrenalin (C) Banvel II & Mixes Curtail M 2,4-D Dichlorprop-D DyVel Estaprop Express Pack K-2 MCPA Prestige Prevail Refine Extra SEE Diphenoprop Stampede EDF & Mixes Triumph Plus[2] Turboprop	Achieve Liquid Gold Adrenalin (C) Advance 10G (fallow year) Ally[1] Attain Badge Banvel II & Mixes Basagran[2] Buctril M 2,4-D Dichlorprop-D DyVel DyVel DS Estaprop Express Pack	Frontline 2,4-D Harmony Total Heritage (fallow year) Hoe-Grass II K-2 Koril Mextrol Pardner Refine Extra SEE Diphenoprop Sencor Sword Target Thumper Triumph Plus[2] Turboprop	Achieve Liquid Gold Ally Badge Buctril M Curtail M Hoe-Grass II K-2[1] Lontrel Mextrol Prestige[2] Prevail Refine Extra	Achieve Liquid Gold Adrenalin (C) Ally Attain Badge Banvel II & Mixes Basagran[2] Buctril M Caliber 400 Clovitox Plus Cobutox 600 Curtail M 2,4-D Dichlorprop-D DyVel DyVel DS Embutox 625 Estaprop Express Pack Frontline Frontline 2,4-D	Harmony Total K-2 MCPA Mextrol Prestige[2] Prevail Refine Extra SEE 2,4-DB SEE Diphenoprop Sencor Spectrum Stampede EDF & Mixes Sword Target Thumper Topside Triumph Plus[2] Tropotox Plus Turboprop Unity
Oats	Banvel II & Mixes Curtail M DyVel MCPA Refine Extra Stampede EDF & Mixes	Badge Buctril M DyVel Koril Mextrol	Pardner Refine Sword Target	Badge Buctril M Curtail M Lontrel Mextrol Refine Extra	Badge Banvel II & Mixes Buctril M Caliber 400 Clovitox Plus Cobutox 600 Curtail M DyVel Embutox 625 MCPA	Mextrol Refine Extra SEE 2,4-DB Spectrum Stampede EDF & Mixes Sword Target Topside Tropotox Plus
Fall Rye (spring application)	2,4-D MCPA	Badge Buctril M 2,4-D	Koril Mextrol Pardner	Badge Buctril M Mextrol	Badge Buctril M Clovitox Plus 2,4-D	MCPA Mextrol Topside Tropotox Plus
Triticale		Hoe-Grass II Koril	Pardner	Hoe-Grass II		

[1] Suppression only
[2] All spring wheat except durum
[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)
[4] See page 42 for resistance information
[5] Top growth control

Herbicide Selector Chart – Cereals

Crop	Stinkweed		Stork's-bill	Tall Buttercup	Tartary Buckwheat	
Barley	Achieve Liquid Gold Ally Assert Attain Badge Banvel II & Mixes Buctril M Caliber 400 Champion Extra Champion Plus Clovitox Plus Cobutox 600 Crossfire Curtail M 2,4-D Dichlorprop-D DyVel DyVel DS Embutox 625 Estaprop Express Pack	Frontline Hoe-Grass II Linuron 480 Lorox MCPA Mextrol Pardner Prestige Prevail Refine Extra SEE 2,4-DB Sencor Spectrum Stampede EDF & Mixes Sword Target Thumper Topside Tropotox Plus Turboprop Unity	Ally Attain Dichlorprop-D Estaprop Frontline[1] Prestige Refine Extra[1] SEE Diphenoprop Spectrum Turboprop	Clovitox Plus[1] Compitox MCPA Na-salt Mecoprop Topside[1] Tropotox Plus[1]	Achieve Liquid Gold Ally Assert[1] Attain Badge Banvel II & Mixes Buctril M Champion Extra Crossfire Curtail M 2,4-D[1] Dichlorprop-D DyVel DyVel DS Estaprop	Hoe-Grass II Koril MCPA[1] Mextrol Pardner Prestige Prevail Refine Extra SEE Diphenoprop Sencor Stampede EDF & Mixes Sword Target Thumper Turboprop
Wheat (C - CLEARFIELD wheat)	Achieve Liquid Gold Adrenalin (C) Ally Assert Attain Badge Banvel II & Mixes Basagran[2] Buctril M Caliber 400 Clovitox Plus Cobutox 600 Crossfire[2] Curtail M 2,4-D Dichlorprop-D DyVel DyVel DS Embutox 625 Estaprop Express Pack Frontline Frontline 2,4-D Harmony Total	Hoe-Grass II K-2 Linuron 480 Lorox MCPA Mextrol Pardner Prestige[2] Prevail Refine Extra SEE 2,4-DB Sencor Spectrum Stampede EDF & Mixes Sundance Sword Target Thumper Topside Triumph Plus[2] Tropotox Plus Turboprop Unity	Ally Attain Basagran[2] Dichlorprop-D Estaprop Frontline[1] Frontline 2,4-D K-2[1] Prestige Refine Extra[1] SEE Diphenoprop Spectrum Turboprop	Adrenalin[5] (C) Basagran[2] Clovitox Plus[1] Compitox MCPA Na-salt Mecoprop Topside[1] Tropotox Plus[1]	Achieve Liquid Gold Adrenalin[5] (C) Ally Assert[1] Attain Badge Banvel II & Mixes Buctril M Crossfire[2] Curtail M 2,4-D[1] Dichlorprop-D DyVel DyVel DS Estaprop Frontline 2,4-D	Harmony Total Hoe-Grass II Koril MCPA[1] Mextrol Pardner Prestige[2] Prevail Refine Extra SEE Diphenoprop Sencor Stampede EDF & Mixes Sword Target Thumper Turboprop
Oats	Badge Banvel II & Mixes Buctril M Caliber 400 Clovitox Plus Cobutox 600 Curtail M DyVel Embutox 625 Frontline Linuron 480 Lorox MCPA	Mextrol Pardner Refine Extra SEE 2,4-DB Spectrum Stampede EDF & Mixes Sword Target Topside Triumph Tropotox Plus	Frontline[1] Refine Extra[1] Spectrum	Clovitox Plus[1] Compitox MCPA Na-salt Mecoprop Topside[1] Tropotox Plus[1]	Badge Banvel II & Mixes Buctril M Curtail M DyVel MCPA[1] Mextrol	Pardner Refine Extra Stampede EDF & Mixes Sword Target
Fall Rye (spring application)	Badge Buctril M Clovitox Plus 2,4-D Koril	MCPA Mextrol Pardner Topside Tropotox Plus		Clovitox Plus[1] MCPA Na-salt Topside[1] Tropotox Plus[1]	Badge Buctril M 2,4-D[1] Koril	MCPA[1] Mextrol Pardner
Triticale	Hoe-Grass II Koril	Pardner			Hoe-Grass II Pardner	

[1] Suppression only
[2] All spring wheat except durum
[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)
[4] See page 42 for resistance information
[5] Top growth control

Herbicide Selector Chart – Cereals

Crop	Toadflax	Volunteer – Canola, Mustard, Rapeseed			Volunteer Oats[4]	
Barley	Ally[1] Estaprop[1] Glyphosate* (pre-harvest) Refine Extra[1] SEE Diphenoprop[1] Turboprop[1]	Achieve Liquid Gold Ally Assert Attain Badge Banvel II & Mixes Buctril M Caliber 400 Champion Extra Champion Plus Clovitox Plus Cobutox 600 Crossfire Curtail M	2,4-D Dichlorprop-D DyVel DyVel DS Embutox 625 Estaprop Express Pack Frontline (all canola) Hoe-Grass II Koril MCPA Mextrol Pardner Prestige Prevail	Refine Extra SEE 2,4-DB SEE Diphenoprop Sencor Spectrum (all canola) Stampede EDF & Mixes Sword Target Thumper Topside Tropotox Plus Turboprop Unity	Achieve Liquid Achieve Liquid Gold Advance 10G Assert Avadex BW Avenge Bonanza Champion Extra	Champion Plus Fortress Hoe-Grass II Hoe-Grass 284 Prevail Puma ^{120} Super Rival 10G Treflan QR5
Wheat (C - CLEARFIELD wheat)	Ally[1] Estaprop[1] Glyphosate* (pre-harvest) K-2[1] Refine Extra[1] SEE Diphenoprop[1] Turboprop[1]	Achieve Liquid Gold Adrenalin[1] (C) Ally Assert Attain Badge Banvel II & Mixes Basagran[2] Buctril M Caliber 400 Clovitox Plus Cobutox 600 Crossfire[2] Curtail M 2,4-D Dichlorprop-D	DyVel DyVel DS Embutox 625 Estaprop Express Pack Frontline (all canola) Frontline 2,4-D Harmony Total Hoe-Grass II Koril K-2[5] MCPA Mextrol Pardner Prestige[2] Prevail	Refine Extra SEE 2,4-DB SEE Diphenoprop Sencor Spectrum (all canola) Stampede EDF & Mixes Sundance Sword Target Thumper Topside Triumph Plus[2] Tropotox Plus Turboprop Unity	Achieve Liquid Achieve Liquid Gold Advance 10G (fallow year) Assert Avadex BW Avenge Everest Fortress Harmony Total Heritage (fallow year)	Hoe-Grass II Hoe-Grass 284 Horizon Horizon BTM K-2 Prevail Puma ^{120} Super Rival 10G[1] (fallow year) Sundance Triumph Plus[2]
Oats	Glyphosate* (pre-harvest) Refine Extra[1]	Badge Banvel II & Mixes Buctril M Caliber 400 Clovitox Plus Cobutox 600 Curtail M DyVel	Embutox 625 Frontline (all canola) Koril MCPA Mextrol Pardner Refine Extra SEE 2,4-DB	Spectrum (all canola) Stampede EDF & Mixes Sword Target Topside Tropotox Plus		
Fall Rye (spring application)		Badge Buctril M Clovitox Plus	2,4-D MCPA Mextrol	Pardner Topside Tropotox Plus	Achieve Liquid Achieve Liquid Gold	Avenge Hoe-Grass 284
Triticale		Hoe-Grass II Pardner			Achieve Liquid Avenge	Hoe-Grass II Hoe-Grass 284

[1] Suppression only

[2] All spring wheat except durum

[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)

[4] See page 42 for resistance information

[5] Top growth control

[6] Including CLEARFIELD canola when applied with 2,4-D Amine

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Cereals

Crop	Wild Buckwheat			Wild Oats[4]		Wild Radish
Barley	Achieve Liquid Gold Ally[1] Assert[1] Attain Badge Banvel II & Mixes Bonanza Buctril M Caliber 400 Champion Extra Champion Plus Cobutox 600 Crossfire[1] Curtail M	2,4-D[1] Dichlorprop-D DyVel DyVel DS Embutox 625 Estaprop Express Pack[1] Frontline Hoe-Grass II Linuron 480 Lontrel Lorox MCPA[1] Mextrol Pardner	Prestige Prevail Refine Extra Rival 10G SEE 2,4-DB SEE Diphenoprop Spectrum Stampede EDF & Mixes Sword Target Thumper Treflan QR5 Turboprop Unity	Achieve Liquid Achieve Liquid Gold Advance 10G Assert Avadex BW Avenge Bonanza Champion Extra	Champion Plus Fortress Hoe-Grass II Hoe-Grass 284 Prevail Puma ^{120} Super Rival 10G Treflan QR5	Attain Banvel II & Mixes Champion Plus Clovitox Plus[1] DyVel Express Pack 2,4-D MCPA Topside[1] Tropotox Plus[1]
Wheat **(C - CLEARFIELD wheat)**	Achieve Liquid Gold Adrenalin[1] (C) Ally[1] Assert[1] Attain Badge Banvel II & Mixes Buctril M Caliber 400 Cobutox 600 Crossfire[1,2] Curtail M 2,4-D[1] Dichlorprop-D DyVel	DyVel DS Embutox 625 Estaprop Express Pack[1] Frontline Frontline 2,4-D Harmony Total Heritage (fallow year) Hoe-Grass II K-2 Linuron 480 Lontrel Lorox MCPA[1] Mextrol Pardner	Prestige[2] Prevail Refine Extra Rival 10G SEE 2,4-DB SEE Diphenoprop Spectrum Stampede EDF & Mixes Sword Target Triumph Plus[2] Thumper Turboprop Unity	Achieve Liquid Achieve Liquid Gold Adrenalin (C) Advance 10G (fallow year) Assert Avadex BW Avenge Everest Fortress Harmony Total	Heritage (fallow year) Hoe-Grass II Hoe-Grass 284 Horizon K-2 Prevail Puma ^{120} Super Rival 10G[1] (fallow year) Sundance Triumph Plus[2]	Adrenalin (C) Attain Banvel II & Mixes Basagran[2] Clovitox Plus[1] 2,4-D DyVel Express Pack Frontline 2,4-D K-2 MCPA Topside[1] Triumph Plus[2] Tropotox Plus[1]
Oats	Badge Banvel II & Mixes Buctril M Caliber 400 Cobutox 600 Curtail M DyVel Embutox 625	Express Pack[1] Frontline Linuron 480 Lontrel Lorox MCPA[1] Mextrol Pardner	Refine Extra SEE 2,4-DB Spectrum Stampede EDF & Mixes Sword Target			Banvel II & Mixes Clovitox Plus[1] DyVel MCPA Topside[1] Tropotox Plus[1]
Fall Rye (spring application)	Badge Buctril M	2,4-D[1] MCPA[1]	Mextrol Pardner	Achieve Liquid Achieve Liquid Gold	Avenge Hoe-Grass 284	Clovitox Plus 2,4-D MCPA Topside Tropotox Plus
Triticale	Hoe-Grass II	Koril	Pardner	Achieve Liquid Avenge	Hoe-Grass II Hoe-Grass 284	

[1] Suppression only
[2] All spring wheat except durum
[3] All spring wheats (including durum when tank mixed with 2,4-D Ester)
[4] See page 42 for resistance information
[5] Top growth control
[6] Including CLEARFIELD canola when applied with 2,4-D Amine

Herbicide Selector Chart – Oilseeds

Crop	Alsike Clover	American Nightshade	Annual Smartweed	Annual Sow-thistle	Barnyard Grass	Black Nightshade	Bluebur
Canola **(C - CLEARFIELD canola)** **(LL - Liberty Link canola)** **(RR - Roundup Ready canola)** **(TTC - triazine tolerant canola)**	Absolute (C)	Eclipse (RR) Edge[1] Reglone[3]	Absolute (C) Bladex (TTC) Eclipse (RR) Edge[1] Factor (RR) Freedom Gold Liberty (LL) Muster Muster Gold II Odyssey (C) Pursuit (C) Pursuit Ultra (C) Reglone[3] Roundup (RR) Sencor (TTC) Vantage (RR)	Absolute (C) Eclipse[1] (RR) Factor (RR) Glyphosate* (pre-harvest) Liberty (LL) Reglone[3] Roundup (RR) Vantage (RR)	Absolute (C) Advance 10G Assure II Bonanza Centurion Edge Factor (RR) Freedom Gold Fusion Hoe-Grass 284 Liberty (LL) Muster Muster Gold II Odyssey (C) Poast Ultra Pursuit Ultra (C) Reglone[3] Rival Roundup (RR) Select Treflan Venture	Eclipse (RR) Edge[1] Reglone[3]	Reglone[3]
Flax		Badge Buctril M Elite Mextrol Reglone[3]	Badge Basagran Buctril M 2,4-D[1] FlaxMax Hoe-Grass II MCPA Amine[1] MCPA Ester[1] Mextrol Reglone[3]	Glyphosate* (pre-harvest) MCPA[1] MCPA K-salt Poast FlaxMax Reglone[3]	Advance 10G Assure II Bonanza Centurion Elite Eptam FlaxMax Fusion Hoe-Grass II Hoe-Grass 284 Poast Ultra Reglone[3] Rival Select Treflan Venture	Reglone[3]	Badge Buctril M Elite MCPA[1] Mextrol Reglone[3]
Mustard		Edge[1] Reglone[3]	Edge[1] Reglone[3]	Reglone[3]	Advance 10G Bonanza Centurion Edge Fusion Hoe-Grass 284 Reglone[3] Rival Select Treflan Venture	Edge[1] Reglone[3]	Reglone[3]
Sunflowers		Edge[1] Reglone[3]	Edge[1] Reglone[3]	Reglone[3]	Advance 10G Bonanza Centurion Edge Eptam Hoe-Grass 284 Reglone[3] Rival Select Treflan Venture	Edge[1] Reglone[3]	

[1] Suppression only

[2] Pre-crop emergence to weed seedlings

[3] Used as a crop desiccant

[4] See page 42 for resistance information

[5] Spring seedlings

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Oilseeds

Crop	Canada Thistle	Cleavers	Common Chickweed	Common Groundsel	Corn Spurry	Cow Cockle	Creeping Buttercup
Canola **(C - CLEARFIELD canola)** **(LL - Liberty Link canola)** **(RR - Roundup Ready canola)** **(TTC - triazine tolerant canola)**	Absolute (C) Factor (RR) Glyphosate* (pre-harvest) Liberty[1] (LL) Lontrel Reglone[3] Roundup (RR) Vantage (RR)	Absolute (C) Bladex (TTC) Eclipse (RR) Edge[1] Factor (RR) Liberty (LL) Odyssey (C) Pursuit (C) Pursuit Ultra (C) Reglone[3] Roundup (RR) Vantage (RR)	Absolute (C) Advance 10G Bladex (TTC) Bonanza Eclipse (RR) Edge Factor (RR) Freedom Gold Liberty (LL) Odyssey (C) Pursuit Ultra (C) Rival Roundup (RR) Sencor (TTC) Treflan Vantage (RR)	Absolute (C) Bladex (TTC) Reglone[3] Sencor (TTC)	Eclipse (RR) Edge Factor (RR) Freedom Gold Reglone[3] Roundup (RR) Sencor (TTC) Vantage (RR)	Advance 10G Bonanza Eclipse (RR) Edge Factor (RR) Freedom Gold Liberty (LL) Reglone[3] Rival Roundup (RR) Treflan Vantage (RR)	Reglone[3]
Flax	Badge[1] Basagran[1] Buctril M[1] Elite[1] FlaxMax Glyphosate* (pre-harvest) Lontrel MCPA[1] Mextrol[1] Reglone[3]	Reglone[3]	Advance 10G Basagran Bonanza Eptam Rival Treflan	Badge Basagran Buctril M Elite FlaxMax Hoe-Grass II Mextrol Reglone[3]	Basagran Eptam MCPA K-salt Reglone[3]	Advance 10G Badge Bonanza Buctril M Elite Hoe-Grass II Mextrol Reglone[3] Rival Treflan	Basagran 2,4-D[1] Reglone[3]
Mustard	Reglone[3]	Reglone[3] Edge[1]	Advance 10G Bonanza Edge Rival Treflan	Reglone[3]	Edge Reglone[3]	Advance 10G Bonanza Edge Reglone[3] Rival Treflan	Reglone[3]
Sunflowers	Reglone[3]		Advance 10G Bonanza Edge Eptam Rival Treflan	Reglone[3]	Edge Eptam Reglone[3]	Advance 10G Bonanza Edge Reglone[3] Rival Treflan	Reglone[3]

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] See page 42 for resistance information
[5] Spring seedlings

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Oilseeds

Crop	Dandelion	Field Bindweed	Field Horsetail	Flixweed	Green Foxtail[4]		Hairy Nightshade
Canola **(C - CLEARFIELD canola)** **(LL - Liberty Link canola)** **(RR - Roundup Ready canola)** **(TTC - triazine tolerant canola)**	Eclipse (RR) Factor (RR) Glyphosate* (pre-harvest) Liberty (LL) Reglone[3] Roundup (RR) Vantage (RR)	Factor (RR) Reglone[3] Roundup (RR)	Reglone[3]	Absolute (C) Factor (RR) Liberty (LL) Muster[5] Muster Gold II[5] Odyssey (C) Reglone[3] Roundup (RR) Sencor (TTC)	Absolute (C) Advance 10G Assure II Bonanza Centurion Eclipse (RR) Edge Factor (RR) Fortress Freedom Gold Fusion Hoe-Grass 284 Liberty (LL)	Muster Muster Gold II NaTA Odyssey (C) Poast Ultra Pursuit Ultra (C) Rival Roundup (RR) Select Treflan Vantage (RR) Venture	Eclipse (RR) Reglone[3]
Flax	FlaxMax[5] Glyphosate* (pre-harvest) MCPA Amine[1] MCPA Ester[1] MCPA K-salt Reglone[3]	Basagran MCPA[1] Reglone[3]	MCPA[1] Reglone[3]	Badge Blagal Buctril M Elite FlaxMax[5] MCPA Mextrol Reglone[3] Stampede EDF & Mixes	Advance 10G Assure II Bonanza Centurion Elite Eptam FlaxMax Fortress Fusion	Hoe-Grass II Hoe-Grass 284 NaTA Poast Ultra Rival Select Stampede EDF Treflan Venture	Basagran Eptam Reglone[3]
Mustard	Reglone[3]	Reglone[3]	Reglone[3]	Reglone[3]	Advance 10G Bonanza Centurion Edge Fortress Fusion	Hoe-Grass 284 Rival Select Treflan Venture	Reglone[3]
Sunflowers					Advance 10G Bonanza Centurion Edge Eptam	Hoe-Grass 284 Rival Select Treflan Venture	Eptam Reglone[3]

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] See page 42 for resistance information
[5] Spring seedlings

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Oilseeds

Crop	Hemp-nettle	Henbit	Knawel	Knotweed	Kochia	Lady's Thumb	Lamb's-quarters
Canola **(C - CLEARFIELD canola)** **(LL - Liberty Link canola)** **(RR - Roundup Ready canola)** **(TTC - triazine tolerant canola)**	Absolute (C) Bladex (TTC) Eclipse (RR) Edge[1] Factor (RR) Freedom Gold Liberty (LL) Muster Muster Gold II Odyssey (C) Pursuit (C) Pursuit Ultra (C) Reglone[3] Roundup (RR) Sencor (TTC) Vantage (RR)	Reglone[3] Sencor (TTC)	Reglone[3]	Advance 10G Bonanza Reglone[3] Rival Treflan	Absolute[1] (C) Eclipse (RR) Edge Factor (RR) Liberty (LL) Odyssey[1] (C) Reglone[3] Roundup (RR) Vantage (RR)	Eclipse (RR) Factor (RR) Roundup (RR) Vantage (RR)	Absolute[1] (C) Advance 10G Bladex (TTC) Bonanza Eclipse (RR) Edge Factor (RR) Freedom Gold Liberty (LL) Odyssey[1] (C) Reglone[3] Rival Roundup (RR) Sencor (TTC) Treflan Vantage (RR)
Flax	MCPA[1] Reglone[3]	Eptam Reglone[3]	Hoe-Grass II Reglone[3]	Advance 10G Bonanza Rival Treflan	Badge Buctril M Elite Hoe-Grass II MCPA Amine MCPA Ester MCPA K-salt Mextrol Reglone[3] Stampede EDF & Mixes	Badge Basagran Buctril M Elite Hoe-Grass II Mextrol Stampede EDF & Mixes	Advance 10G Badge Basagran Bonanza Buctril M Elite Eptam FlaxMax Hoe-Grass II MCPA Mextrol Reglone[3] Rival Stampede EDF & Mixes Treflan
Mustard	Edge[1] Reglone[3]	Reglone[3]	Reglone[3]	Advance 10G Bonanza Reglone[3] Rival Treflan	Edge Reglone[3]		Advansce 10G Bonanza Edge Reglone[3] Rival Treflan
Sunflowers	Edge[1] Reglone[3]	Eptam Reglone[3]		Advance 10G Bonanza Reglone[3] Rival Treflan	Edge Reglone[3]		Advance 10G Bonanza Edge Eptam Reglone[3] Rival Treflan

[1] Suppression only

[2] Pre-crop emergence to weed seedlings

[3] Used as a crop desiccant

[4] See page 42 for resistance information

[5] Spring seedlings

Herbicide Selector Chart – Oilseeds

Crop	Leafy Spurge	Narrow-leaved Hawk's-beard	Night-flowering Catchfly	Perennial Sow-thistle	Persian Darnel	Prostrate Pigweed
Canola **(C - CLEARFIELD canola)** **(LL - Liberty Link canola)** **(RR - Roundup Ready canola)** **(TTC - triazine tolerant canola)**	Reglone[3]	Factor (RR) Reglone[3] Roundup (RR)	Reglone[3] Sencor (TTC)	Absolute (C) Eclipse[1] (RR) Factor (RR) Glyphosate* (pre-harvest) Liberty (LL) Lontrel[1] Reglone[3] Roundup (RR) Vantage (RR)	Absolute (C) Advance 10G Bonanza Centurion Factor (RR) Fusion Hoe-Grass 284 Odyssey (C) Poast Ultra Pursuit Ultra (C) Reglone[3] Rival Roundup (RR) Select Treflan Venture	Edge Reglone[3]
Flax	MCPA[1] Reglone[3]	Reglone[3]	Badge Buctril M Elite Hoe-Grass II Mextrol Reglone[3]	Badge[1] Buctril M[1] Elite[1] FlaxMax Glyphosate* (pre-harvest) Lontrel[1] MCPA[1] Mextrol[1] Reglone[3]	Advance 10G Bonanza Centurion Elite FlaxMax Fusion Hoe-Grass II Hoe-Grass 284 Poast Ultra Reglone[3] Rival Select Treflan Venture	Eptam (ppi) MCPA K-salt Reglone[3]
Mustard	Reglone[3]	Reglone[3]	Reglone[3]	Reglone[3]	Advance 10G Bonanza Centurion Fusion Hoe-Grass 284 Reglone[3] Rival Select Treflan Venture	Edge Reglone[3]
Sunflowers			Reglone[3]	Reglone[3]	Advance 10G Bonanza Centurion Hoe-Grass 284 Reglone[3] Rival Select Treflan Venture	Edge Eptam Reglone[3]

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] See page 42 for resistance information
[5] Spring seedlings

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Oilseeds

Crop	Quack Grass	Ragweed	Redroot Pigweed	Round-leaf Mallow	Russian Pigweed	Russian Thistle[4]	Scentless Chamomile
Canola **(C - CLEARFIELD canola)** **(LL - Liberty Link canola)** **(RR - Roundup Ready canola)** **(TTC - triazine tolerant canola)**	Assure II Centurion Eclipse (RR) Factor (RR) Glyphosate* (pre-harvest) Liberty[1] (LL) Muster Gold II NaTA Poast Ultra Pursuit Ultra[1] (C) Reglone[3] Roundup (RR) Select Vantage (RR) Venture[1]	Factor (RR) Reglone[3] Roundup (RR)	Absolute (C) Bladex (TTC) Eclipse (RR) Edge Factor (RR) Freedom Gold Liberty (LL) Muster Odyssey (C) Pursuit (C) Pursuit Ultra (C) Reglone[3] Roundup (RR) Sencor (TTC) Vantage (RR)	Factor (RR) Liberty (LL) Roundup (RR)	Edge Freedom Gold Reglone[3] Sencor (TTC)	Absolute (C) Bonanza Eclipse (RR) Edge[1] Factor (RR) Liberty (LL) Rival Odyssey (C) Roundup (RR) Sencor (TTC) Vantage (RR)	Absolute (C) Liberty (LL) Lontrel Reglone[3]
Flax	Assure II Centurion Elite[1] Eptam Glyphosate* (pre-harvest) Poast Ultra Reglone[3] Select Venture[1]	Badge Basagran Buctril M MCPA Mextrol Reglone[3]	Basagran Eptam (ppi) FlaxMax Hoe-Grass II MCPA Ester[1] MCPA K-salt MCPA Na-salt Reglone[3]		FlaxMax Reglone[3]	Badge Basagran Bonanza Buctril M 2,4-D[1] Elite Hoe-Grass II MCPA Mextrol Rival	Badge Buctril M Elite[5] FlaxMax Hoe-Grass II Lontrel Mextrol Reglone[3]
Mustard	Centurion Reglone[3] Select Venture[1]	Reglone[3]	Edge Reglone[3]		Edge Reglone[3]	Bonanza Edge[1] Rival	Reglone[3]
Sunflowers	Centurion Eptam Reglone[3] Select Venture[1]		Edge Eptam (ppi)		Edge Reglone[3]	Bonanza Edge[1] Rival	

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] See page 42 for resistance information
[5] Spring seedlings

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Oilseeds

Crop	Shepherd's-purse	Stinkweed	Stork's-bill	Tall Buttercup	Tartary Buckwheat	Toadflax	Tufted Vetch
Canola **(C - CLEARFIELD canola)** **(LL - Liberty Link canola)** **(RR - Roundup Ready canola)** **(TTC - triazine tolerant canola)**	Absolute (C) Bladex (TTC) Eclipse (RR) Factor (RR) Liberty (LL) Odyssey (C) Pursuit (C) Reglone[3] Roundup (RR) Sencor (TTC) Vantage (RR)	Absolute (C) Bladex (TTC) Eclipse (RR) Factor (RR Freedom Gold Liberty (LL) Muster Muster Gold II Odyssey (C) Pursuit (C) Pursuit Ultra (C) Reglone[3] Roundup (RR) Sencor (TTC) Vantage (RR)	Absolute (C) Factor (RR Liberty (LL) Odyssey (C) Reglone[3] Roundup (RR)	Reglone[3]	Reglone[3] Sencor (TTC)	Glyphosate* (pre-harvest)	Absolute (C)
Flax	Badge Basagran Buctril M Elite FlaxMax MCPA[1] Mextrol Reglone[3]	Badge Basagran Buctril M Elite FlaxMax[5] Hoe-Grass II MCPA Mextrol Reglone[3] Stampede EDF	Basagran Reglone[3]	Basagran MCPA Na-salt Reglone[3]	Badge Buctril M Elite FlaxMax Hoe-Grass II MCPA[1] Mextrol Reglone[3] Stampede EDF & Mixes	Glyphosate* (pre-harvest)	
Mustard	Reglone[3]	Reglone[3]	Reglone[3]	Reglone[3]	Reglone[3]		
Sunflowers	Reglone[3]	Assert Reglone[3]		Reglone[3]	Reglone[3]		

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] See page 42 for resistance information
[5] Spring seedlings

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Oilseeds

Crop	Volunteer Alfalfa	Volunteer Barley	Volunteer Canola	Volunteer – Mustards, Rapeseed	Volunteer Oats[4]	
Canola **(C - CLEARFIELD canola)** **(LL - Liberty Link canola)** **(RR - Roundup Ready canola)** **(TTC - triazine tolerant canola)**	Absolute (C)	Absolute (C) Assure Centurion Eclipse (RR) Factor (RR) Fusion Muster Gold II Pursuit Ultra (C) Roundup (RR) Select Vantage (RR) Venture	Absolute (C) (non C varieties) Eclipse (non RR varieties) Liberty (non LL canola) Pursuit (not C varieties) Pursuit Ultra (non C varieties) Roundup (non RR varieties)	Absolute (C) Bladex (TTC) Eclipse (RR) Factor (RR) Freedom Gold Liberty (LL) Muster Muster Gold II Pursuit (C) Pursuit Ultra (C) Odyssey (C) Reglone[3] Roundup (RR) Sencor (TTC) Vantage (RR)	Absolute (C) Advance 10G Assure II Avadex BW Bonanza Centurion Eclipse (RR) Edge Factor (RR) FlaxMax Fortress Freedom Gold Fusion	Hoe-Grass 284 Liberty (LL) Muster Gold II Odyssey (C) Poast Ultra Pursuit Ultra (C) Rival Roundup (RR) Select Treflan Vantage (RR) Venture
Flax		Assure Centurion Elite Fusion Select Venture		Badge Basagran Buctril M Elite FlaxMax Hoe-Grass II MCPA Mextrol Reglone[3] Stampede EDF & Mixes	Advance 10G Assure II Avadex BW Bonanza Centurion Elite Eptam Fortress	Fusion Hoe-Grass II Hoe-Grass 284 Poast Ultra Rival Select Treflan Venture
Mustard		Centurion Fusion Select		Reglone[3]	Advance 10G Avadex BW Bonanza Centurion Edge Fortress	Fusion Hoe-Grass 284 Rival Select Treflan Venture
Sunflowers		Centurion Select		Assert Reglone[3]	Advance 10G Bonanza Centurion Edge Eptam	Hoe-Grass 284 Rival Select Treflan Venture

[1] Suppression only

[2] Pre-crop emergence to weed seedlings

[3] Used as a crop desiccant

[4] See page 42 for resistance information

[5] Spring seedlings

Herbicide Selector Chart – Oilseeds

Crop	Volunteer Wheat	Wild Buckwheat	Wild Oats[4]		Wild Radish	Wild Tomato	Witchgrass
Canola **(C - CLEARFIELD canola)** **(LL - Liberty Link canola)** **(RR - Roundup Ready canola)** **(TTC - triazine tolerant canola)**	Assure Centurion Eclipse (RR) Factor (RR) Fusion Muster Gold II Pursuit Ultra (C) Roundup (RR) Select Vantage (RR) Venture	Absolute (C) Advance 10G Bladex (TTC) Bonanza Eclipse (RR) Edge Factor (RR) Freedom Gold Liberty (LL) Lontrel Odyssey (C) Pursuit (C) Pursuit Ultra (C) Reglone[3] Rival Roundup (RR) Treflan	Absolute (C) Advance 10G Assure II Avadex BW Bonanza Centurion Eclipse (RR) Edge Factor (RR) FlaxMax Fortress Freedom Gold Fusion	Hoe-Grass 284 Liberty (LL) Muster Gold II Odyssey (C) Poast Ultra Pursuit Ultra (C) Rival Roundup (RR) Select Treflan Vantage (RR) Venture	Reglone[3] Sencor (TTC)	Factor (RR) Roundup (RR) Vantage (RR)	Centurion Pursuit Ultra (C) Select Venture
Flax	Assure Centurion Elite Fusion Select Venture	Advance 10G Badge Bonanza Buctril M Elite FlaxMax Hoe-Grass II Lontrel Mextrol Rival Stampede EDF & Mixes Treflan	Advance 10G Assure II Avadex BW Bonanza Centurion Elite Eptam Fortress	Fusion Hoe-Grass II Hoe-Grass 284 Poast Ultra Rival Select Treflan Venture	Basagran Hoe-Grass II MCPA Reglone[3] Stampede EDF & Mixes	Badge Buctril M Elite Mextrol	Centurion Elite Select Venture
Mustard	Centurion Fusion Select Venture	Advance 10G Bonanza Edge Reglone[3] Rival Treflan	Advance 10G Avadex BW Bonanza Centurion Edge Fortress	Fusion Hoe-Grass 284 Rival Select Treflan Venture	Reglone[3]		Centurion Select Venture
Sunflowers	Centurion Select Venture	Advance 10G Bonanza Edge Reglone[3] Rival Treflan	Advance 10G Bonanza Centurion Edge Eptam	Hoe-Grass 284 Rival Select Treflan Venture	Reglone[3]		Centurion Select Venture

[1] Suppression only

[2] Pre-crop emergence to weed seedlings

[3] Used as a crop desiccant

[4] See page 42 for resistance information

[5] Spring seedlings

Herbicide Selector Chart – Forage Legumes

Crop	Crop Stage	Annual Smartweed	Barnyard Grass		Bluebur	Canada Thistle		Chickweed
Alfalfa	Seeding	Basagran[5] Caliber 400[1] Cobutox 600[1] Embutox 625[1] Pardner[5] Pursuit[5] SEE 2,4-DB[1]	Advance 10G Centurion Edge[5] Eptam (ppi) Hoe-Grass 284[4]	Poast Ultra[4] Select Treflan Venture	Pardner[5]	Amitrol 240[4,6] Basagran[1,5] Caliber 400[1] Cobutox 600[1]	Embutox 625[1] Glyphosate[6,*] SEE 2,4-DB[1]	Advance 10G Basagran[5] Edge[5] Eptam (ppi) Kerb[4] Treflan
	Established	Pardner[5] Princep[4] Reglone[3] Simazine 80W[4]	Assure II[5] Poast Ultra[4] Princep[4]	Reglone[3] Simazine 80W[4] Venture[4]	Pardner[5] Reglone[3]	Amitrol 240[4,6] Glyphosate[6,*]	Reglone[1,3]	Kerb[4] Reglone[3]
Alsike Clover	Seeding	Basagran[5] Caliber 400[1] Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1]	Bonanza 400 Hoe-Grass 284[5]	Poast Ultra[5] Treflan		Amitrol 240[4,6] Basagran[1,5] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1]	Embutox 625[1] Glyphosate[6,*] SEE 2,4-DB[1] Topside[1] Tropotox Plus[1]	Basagran[5] Bonanza 400 Treflan
	Established		Poast Ultra[5]			Amitrol 240[4,6]	Glyphosate[6,*]	
Red Clover	Seeding	Basagran[5]	Bonanza 400 Hoe-Grass 284[4]	Treflan Venture[4]		Amitrol 240[4,6] Basagran[1,5] Clovitox Plus[1]	Glyphosate[6,*] Topside[1] Tropotox Plus[1]	Basagran[5] Bonanza 400 Treflan
	Established	Reglone[3]	Reglone[3] Venture[4]		Reglone[3]	Amitrol 240[4,6] Glyphosate[6,*]	Reglone[1,3]	Reglone[3]
Sweet Clover	Seeding		Bonanza 400 Eptam[1] Hoe-Grass 284[4]	Poast Ultra[5] Rival Treflan		Amitrol 240[4,6]	Glyphosate[6,*]	Bonanza 400 Eptam[1] Rival Treflan
	Established		Poast Ultra[5]			Amitrol 240[4,5]	Glyphosate[6,*]	
White Dutch Clover	Seeding	Caliber 400[1] Clovitox Plus Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1] Topside[1] Tropotox Plus[1]				Amitrol 240[4,6] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Embutox 625[1]	Glyphosate[6,*] SEE 2,4-DB[1] Topside[1] Tropotox Plus[1]	
	Established	Reglone[3]	Reglone[3]		Reglone[3]	Amitrol 240[4,5] Glyphosate[6,*]	Reglone[1,3]	Reglone[3]
Bird's-foot Trefoil	Seeding	Caliber 400[1] Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1]	Bonanza 400 Eptam (ppi)	Treflan Venture[4]		Caliber 400[1] Cobutox 600[1] Embutox 625[1]	Glyphosate[6,*] SEE 2,4-DB[1]	Bonanza 400 Eptam (ppi) Kerb[4] Treflan
	Established	Princep[4] Reglone[3] Simazine 80W[4]	Princep[4] Reglone[3]	Simazine 80W[4] Venture[4]	Reglone[3]	Reglone[1,3]	Glyphosate[6,*]	Kerb[4] Reglone[3]
Sainfoin	With Legumes	Basagran[5]	Hoe-Grass 284[5] Poast Ultra[5]	Rival 500/DF Treflan		Basagran[1,5]	Glyphosate[6,*]	Basagran[5] Rival 500/DF Treflan
	No Legumes		Poast Ultra[5]			Glyphosate[6,*]		

[1] Suppression only

[2] Pre-crop emergence to weed seedlings

[3] Used as a crop desiccant

[4] Grazing or feeding restrictions

[5] Seed production only

[6] Spot treatment only

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Forage Legumes

Crop	Crop Stage	Clovers	Common Groundsel	Corn Spurry	Dandelion	Field Bindweed		Flixweed (seedlings)
Alfalfa	Seeding		Basagran[5] Pardner[5]	Basagran[5] Edge[5] Eptam (ppi)	Caliber 400[1] Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1] Glyphosate[6*]	Basagran[1,5] Caliber 400[1] Cobutox 600[1]	Embutox 625[1] Glyphosate[6*] SEE 2,4-DB[1]	
	Established	Princep[4] Regione[1,3] Simazine 80W[4]	Pardner[5] Regione[3]	Regione[3]	Glyphosate[6*] Regione[1,3] Velpar[5]	Glyphosate[6*]	Regione[1,3]	Regione[3] Sencor (irr)[4]
Alsike Clover	Seeding		Basagran[5]	Basagran[5]	Caliber 400[1] Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1] Glyphosate[6*]	Basagran[1,5] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Embutox 625[1]	Glyphosate[6*] SEE 2,4-DB[1] Topside[1] Tropotox Plus[1]	
	Established				Glyphosate[6*]	Glyphosate[6*]		
Red Clover	Seeding		Basagran[5]	Basagran[5]	Glyphosate[6*]	Basagran[1,5] Clovitox Plus[1] Glyphosate[6*]	Topside[1] Tropotox Plus[1]	
	Established	Regione[1,3]	Regione[3]	Regione[3]	Glyphosate[6*] Regione[1,3]	Glyphosate[6*]	Regione[1,3]	Regione[3]
Sweet Clover	Seeding			Eptam[1]	Glyphosate[6*]	Glyphosate[6*]		
	Established				Glyphosate[6*]	Glyphosate[6*]		
White Dutch Clover	Seeding				Caliber 400[1] Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1] Glyphosate[6*]	Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Embutox 625[1]	Glyphosate[6*] SEE 2,4-DB[1] Topside[1] Tropotox Plus[1]	
	Established	Regione[1,3]	Regione[3]	Regione[3]	Glyphosate[6*] Regione[1,3]	Glyphosate[6*]	Regione[1,3]	Regione[3]
Bird's-foot Trefoil	Seeding			Eptam (ppi)	Caliber 400[1] Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1] Glyphosate[6*]	Caliber 400[1] Cobutox 600[1] Embutox 625[1]	Glyphosate[6*] SEE 2,4-DB[1]	
	Established	Princep[4] Regione[1,3] Simazine 80W[4]	Regione[3]	Regione[3]	Glyphosate[6*] Regione[1,3]	Glyphosate[6*]	Regione[1,3]	Regione[3]
Sainfoin	With Legumes		Basagran[5]	Basagran[5]	Glyphosate[6*]	Basagran[1,5]	Glyphosate[6*]	
	No Legumes				Glyphosate[6*]	Glyphosate[6*]		

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

[*] Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Forage Legumes

Crop	Crop Stage	Foxtail Barley	Green Foxtail		Kochia	Lamb's-quarters		Leafy Spurge
Alfalfa	Seeding		Achieve Liquid[4] Advance 10G Centurion Edge[5] Eptam (ppi) Hoe-Grass 284[4]	Poast Ultra[4] Pursuit[1,5] Select Treflan Venture[4]	Edge[5] Odyssey[1] Pardner[5]	Advance 10G Basagran[5] Caliber 400 Clovitox Plus[5] Cobutox 600 Edge[5] Embutox 625	Eptam (ppi) Pardner[5] SEE 2,4-DB Topside[5] Treflan Tropotox Plus[5]	Amitrol 240[4,6]
	Established	Kerb[4] Regione[1,3]	Assure II[5] Poast Ultra[4] Pursuit[1,5]	Regione[3] Venture[4]	Odyssey[1] Pardner[1] Regione[3] Sencor (irr)[4]	Pardner[1] Princep[4] Regione[3]	Sencor (irr)[4] Simazine 80W[4]	Amitrol 240[4,6] Regione[1,3]
Alsike Clover	Seeding		Achieve Liquid[4] Hoe-Grass 284[5]	Poast Ultra[5] Treflan		Basagran[5] Bonanza 400 Caliber 400 Clovitox Plus Cobutox 600	Embutox 625 SEE 2,4-DB Topside Treflan Tropotox Plus	Amitrol 240[4,6]
	Established		Poast Ultra[5]					Amitrol 240[4,6]
Red Clover	Seeding		Achieve Liquid[4] Hoe-Grass 284[4]	Treflan Venture[4]		Basagran[5] Bonanza 400 Clovitox Plus	Topside Treflan Tropotox Plus	Amitrol 240[4,6]
	Established	Regione[1,3]	Regione[3] Venture[4]		Regione[3]	Regione[3]		Amitrol 240[4,6] Regione[1,3]
Sweet Clover	Seeding		Achieve Liquid[4] Eptam[1] Hoe-Grass 284[4]	Poast Ultra[5] Rival Treflan		Bonanza 400 Eptam[1]	Rival 500/DF Treflan	Amitrol 240[4,6]
	Established		Poast Ultra[5]					Amitrol 240[4,6]
White Dutch Clover	Seeding		Achieve Liquid[4]			Caliber 400 Clovitox Plus Cobutox 600 Embutox 625	SEE 2,4-DB Topside Tropotox Plus	Amitrol 240[4,6]
	Established	Regione[1,3]	Regione[3]		Regione[3]	Regione[3]		Amitrol 240[4,6] Regione[1,3]
Bird's-foot Trefoil	Seeding		Achieve Liquid[4] Eptam (ppi)	Treflan Venture[4]		Bonanza 400 Caliber 400 Cobutox 600 Embutox 625	Eptam (ppi) SEE 2,4-DB Treflan	Amitrol 240[4,6]
	Established	Kerb[4] Regione[1,3]	Regione[3] Venture[4]		Regione[3]	Princep[4] Regione[3]	Simazine 80W[4]	Amitrol 240[4,6] Regione[1,3]
Sainfoin	With Legumes		Achieve Liquid[4] Hoe-Grass 284[5] Poast Ultra[5]	Rival 500/DF Treflan		Basagran[5] Rival 500/DF Treflan		Amitrol 240[4,6]
	No Legumes		Poast Ultra[5]					Amitrol 240[4,6]

[1] Suppression only
[2] Pre crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Forage Legumes

Crop	Crop Stage	Mustards		Narrow-leaved Hawk's-beard	Night-flowering Catchfly	Perennial Sow-thistle	
Alfalfa	Seeding	Basagran[5] Caliber 400 Clovitox Plus[5] Cobutox 600 Embutox 625	Pardner[5] Pursuit SEE 2,4-DB Topside[5] Tropotox Plus[5]	Caliber 400 Cobutox 600 Embutox 625 SEE 2,4-DB		Amitrol 240[4,6] Caliber 400[1] Cobutox 600[1]	Embutox 625[1] Glyphosate[6]* SEE2,4-DB[1]
	Established	Pardner[5] Pursuit[5] Reglone[3]		Reglone[1,3] Velpar5	Pardner[5] Reglone[3]	Amitrol 240[4,6] Clovitox Plus Glyphosate[6]*	Reglone[5,6] Tropotox Plus Velpar[5]
Alsike Clover	Seeding	Basagran[5] Caliber 400 Clovitox Plus Cobutox 600	Embutox 625 SEE 2,4-DB Topside Tropotox Plus	Caliber 400 Cobutox 600 Embutox 625 SEE 2,4-DB		Amitrol 240[4,6] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Embutox 625[1]	Glyphosate[6]* SEE 2,4-DB[1] Topside[1] Tropotox Plus[1]
	Established					Amitrol 240[4,6]	Glyphosate[6]*
Red Clover	Seeding	Basagran[5] Clovitox Plus	Topside Tropotox Plus			Amitrol 240[4,6] Clovitox Plus[1] Glyphosate[6]*	Topside[1] Tropotox Plus[1]
	Established	Reglone[3]		Reglone[1,3]	Reglone[3]	Amitrol 240[4,6] Glyphosate[6]*	Reglone[1,3]
Sweet Clover	Seeding					Amitrol 240[4,6]	Glyphosate[6]*
	Established					Amitrol 240[4,6]	Glyphosate[6]*
White Dutch Clover	Seeding	Caliber 400 Clovitox Plus Cobutox 600 Embutox 625	SEE 2,4-DB Topside Tropotox Plus	Caliber 400 Cobutox 600 Embutox 625 SEE 2,4-DB		Amitrol 240[4,6] Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Embutox 625[1]	Glyphosate[6]* SEE 2,4-DB[1] Topside[1] Tropotox Plus[1]
	Established	Reglone[3]		Reglone[1,3]	Reglone[3]	Amitrol 240[4,6] Glyphosate[6]*	Reglone[1,3]
Bird's-foot Trefoil	Seeding	Caliber 400 Cobutox 600	Embutox 625 SEE 2,4-DB	Caliber 400 Cobutox 600 Embutox 625 SEE 2,4-DB		Caliber 400[1] Cobutox 600[1] Embutox 625[1]	Glyphosate[6]* SEE 2,4-DB[1]
	Established	Reglone[3]		Reglone[1,3]	Reglone[3]	Glyphosate[6]*	Reglone[3]
Sainfoin	With Legumes	Basagran[5]				Glyphosate[6]*	
	No Legumes					Glyphosate[6]*	

[1] Suppression only
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[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Forage Legumes

Crop	Crop Stage	Quack Grass		Redroot Pigweed		Scentless Chamomile (seedlings)	Shepherd's-purse (seedlings)	Stinkweed (seedlings)
Alfalfa	Seeding	Amitrol 240[4,6] Centurion Eptam (ppi)[1] Glyphosate[6]*	Poast Ultra[1,4] Select Venture[1,4]	Advance 10G Basagran[1,5] Caliber 400 Clovitox Plus[5] Cobutox 600 Edge[5] Embutox 625	Eptam (ppi) Pardner[5] Pursuit SEE 2,4-DB Topside[5] Treflan Tropotox Plus[5]		Basagran[5] Caliber 400 Clovitox Plus[5] Cobutox 600 Embutox 625 SEE 2,4-DB Topside[5] Tropotox Plus[5]	Basagran[5] Caliber 400 Clovitox Plus[5] Cobutox 600 Embutox 625 Pardner[5] Pursuit SEE 2,4-DB Topside[5] Tropotox Plus[5]
	Established	Amitrol 240[4,6] Assure II[5] Glyphosate[6]* Kerb[4]	Poast Ultra[1,4] Reglone[1,3] Velpar[5] Venture[1,4]	Pardner[5] Pursuit[5] Reglone[3] Sencor (irr)[4]		Pardner[5] Reglone[1,3] Velpar[5]	Reglone[3] Sencor (irr)[4]	Pardner[5] Pursuit[5] Reglone[3] Sencor (irr)[4]
Alsike Clover	Seeding	Amitrol 240[4,6] Glyphosate[6]*	Poast Ultra[1,5]	Basagran[1,5] Bonanza 400 Caliber 400 Clovitox Plus Cobutox 600	Embutox 625 SEE 2,4-DB Topside Treflan Tropotox Plus		Basagran[1,5] Caliber 400 Clovitox Plus Cobutox 600 Embutox 625 SEE 2,4-DB Topside Tropotox Plus	Basagran[5] Caliber 400 Clovitox Plus Cobutox 600 Embutox 625 SEE 2,4-DB Topside Tropotox Plus
	Established	Amitrol 240[4,6] Glyphosate[6]*	Poast Ultra[1,5]					
Red Clover	Seeding	Amitrol 240[4,6] Glyphosate[6]*	Venture[1,4]	Basagran[1,5] Bonanza 400 Clovitox Plus	Topside Treflan Tropotox Plus		Basagran[5] Clovitox Plus Topside Tropotox Plus	Basagran[5] Clovitox Plus Topside Tropotox Plus
	Established	Amitrol 240[4,6] Glyphosate[6]*	Reglone[1,3]	Reglone[3]		Reglone[1,3]	Reglone[3]	Reglone[3]
Sweet Clover	Seeding	Amitrol 240[4,6] Eptam[1] Glyphosate[6]*	Poast Ultra[1,5]	Bonanza 400 Eptam[1]	Rival 500/DF Treflan			
	Established	Amitrol 240[4,6] Glyphosate[6]*	Poast Ultra[1,5]					
White Dutch Clover	Seeding	Amitrol 240[4,6]	Glyphosate[6]*	Caliber 400 Clovitox Plus Cobutox 600 Embutox 625	SEE 2,4-DB Topside Tropotox Plus		Caliber 400 Clovitox Plus Cobutox 600 Embutox 625 SEE 2,4-DB Topside Tropotox Plus	Caliber 400 Clovitox Plus Cobutox 600 Embutox 625 SEE 2,4-DB Topside Tropotox Plus
	Established	Amitrol 240[4,6] Glyphosate[6]*	Reglone[1,3]	Reglone[3]		Reglone[1,3]	Reglone[3]	Reglone[3]
Bird's-foot Trefoil	Seeding	Kerb[4] Eptam (ppi)[1] Glyphosate[6]*	Venture[1,4]	Bonanza 400 Caliber 400 Cobutox 600 Embutox 625	Eptam (ppi) SEE 2,4-DB Treflan		Caliber 400 Cobutox 600 Embutox 625 SEE 2,4-DB	Caliber 400 Cobutox 600 Embutox 625 SEE 2,4-DB
	Established	Kerb[4] Glyphosate[6]*	Reglone[3] Venture[1,4]	Reglone[3]		Reglone[1,3]	Reglone[3]	Reglone[3]
Sainfoin	With Legumes	Glyphosate[6]*	Poast Ultra[1,5]	Basagran[1,5] Rival 500/DF	Treflan		Basagran[5]	Basagran[5]
	No Legumes	Glyphosate[6]*	Poast Ultra[1,5]					

[1] Suppression only

[2] Pre-crop emergence to weed seedlings

[3] Used as a crop desiccant

[4] Grazing or feeding restrictions

[5] Seed production only

[6] Spot treatment only

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Forage Legumes

Crop	Crop Stage	Toadflax		Wild Buckwheat		Wild Oats	
Alfalfa	Seeding	Amitrol 240[4,6]	Glyphosate[6*]	Advance 10G Bonanza 10G Caliber 400 Cobutox 600 Edge[5]	Embutox 625 Pardner[5] SEE 2,4-DB Treflan	Achieve Liquid[4] Advance 10G Avadex BW[4] Avenge[4] Centurion Edge[5] Eptam (ppi)	Hoe-Grass 284[4] Kerb[4] Poast Ultra[4] Select Treflan Venture[4]
	Established	Amitrol 240[4,6] Glyphosate[6*]	Reglone[1,3]	Pardner[5] Princep[4]	Reglone[3] Simazine 80W[4]	Assure II[5] Kerb[4] Poast Ultra[4] Princep[4]	Reglone[3] Sencor (irr)[4] Simazine 80W[4] Venture[4]
Alsike Clover	Seeding	Amitrol 240[4,6]	Glyphosate[6*]	Bonanza 400 Caliber 400 Cobutox 600	Embutox 625 SEE 2,4-DB Treflan	Achieve Liquid[4] Avadex BW[4] Hoe-Grass 284[5]	Poast Ultra[5] Treflan
	Established	Amitrol 240[4,6]	Glyphosate[6*]			Poast Ultra[5]	
Red Clover	Seeding	Amitrol 240[4,6]	Glyphosate[6*]	Bonanza 400 Treflan		Achieve Liquid[4] Avadex BW[4] Avenge[4]	Hoe-Grass 284[4] Treflan Venture[4]
	Established	Amitrol 240[4,6] Glyphosate[6*]	Reglone[1,3]	Reglone[3]		Reglone[3]	Venture[4]
Sweet Clover	Seeding	Amitrol 240[4,6]	Glyphosate[6*]	Bonanza 400 Rival	Treflan	Achieve Liquid[4] Avadex BW[4] Avenge[4] Eptam[1]	Hoe-Grass 284[4] Poast Ultra[5] Rival 500/DF Treflan
	Established	Amitrol 240[4,6]	Glyphosate[6*]			Poast Ultra[5]	
White Dutch Clover	Seeding	Amitrol 240[4,6]	Glyphosate[6*]	Caliber 400 Cobutox 600	Embutox 625 SEE 2,4-DB	Achieve Liquid[4] Avadex BW[4]	
	Established	Amitrol 240[4,6] Glyphosate[6*]	Reglone[1,3]	Reglone[3]		Reglone[3]	
Bird's-foot Trefoil	Seeding	Glyphosate[6*]		Bonanza 400 Caliber 400 Cobutox 600	Embutox 625 SEE 2,4-DB Treflan	Achieve Liquid[4] Avadex BW[4] Avenge[4] Eptam (ppi)	Kerb[4] Treflan Venture[4]
	Established	Reglone[1,3]	Glyphosate[6*]	Princep[4] Reglone[3] Simazine 80W[4]		Kerb[4] Princep[4] Reglone[3]	Simazine 80W[4] Venture[4]
Sainfoin	With Legumes	Glyphosate[6*]		Rival 500/DF Treflan		Achieve Liquid[4] Hoe-Grass 284[5] Poast Ultra[5]	Rival 500/DF Treflan
	No Legumes	Glyphosate[6*]				Poast Ultra[5]	

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[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

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Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Annual Smartweed			Barnyard Grass	Bluebur
Smooth Brome	Seedling	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400[1]	2,4-D Embutox 625[1] Hoe Grass II[5] Mextrol[5] Pardner[5]	SEE 2,4-DB[1] Sword Target Triumph Plus	Hoe Grass 284[4] Hoe Grass II[5]	Badge[5] Buctril M[5] 2,4-D Mextrol[5] Pardner[5]
	Established	2,4-D MCPA Amine[1]	MCPA Ester[1]			2,4-D MCPA Amine MCPA Ester
Crested Wheatgrass	Seedling	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400[1]	2,4-D Embutox 625[1] Hoe Grass II[5] Mextrol[5]	Pardner[5] SEE 2,4-DB[1] Sword Target	Hoe Grass 284[4] Hoe Grass II[5]	Badge[5] Buctril M[5] 2,4-D Mextrol[5] Pardner[5]
	Established	Ally[1] 2,4-D	MCPA Amine[1] MCPA Ester[1]			Ally 2,4-D MCPA Amine MCPA Ester
Intermediate Wheatgrass	Seedling	Badge[5] Banvel II & Mixes Buctril M[5] Caliber 400[1] 2,4-D	Embutox 625[1] Hoe Grass II[5] Pardner[5] Mextrol[5]	SEE 2,4-DB[1] Sword Target Triumph Plus	Hoe Grass 284[4] Hoe Grass II[5]	Badge[5] Buctril M[5] 2,4-D Mextrol[5] Pardner[5]
	Established	Ally[1] 2,4-D	MCPA Amine[1] MCPA Ester[1]			Ally 2,4-D MCPA Amine MCPA Ester
Creeping Red Fescue	Seedling	Badge[5] Banvel II + 2,4-D Basagran[5] Buctril M[5] Caliber 400[1]	2,4-D Embutox 625[1] Hoe Grass II[5] Mextrol[5] Pardner[5]	SEE 2,4-DB[1] Sword Target Triumph Plus	Hoe Grass 284[4] Hoe Grass II[5] Poast Ultra[5] Venture[5]	Badge[5] Buctril M[5] 2,4-D Mextrol[5] Pardner[5]
	Established	Ally Banvel II + 2,4-D 2,4-D	MCPA Amine[1] MCPA Ester[1] Mextrol[5]		Poast Ultra[5] Venture[5]	Ally[1] 2,4-D MCPA Amine MCPA Ester
Russian Wild Rye	Seedling	Badge[5] Buctril M[5] 2,4-D	Hoe Grass II[5] Mextrol[5] Pardner[5]		Hoe Grass 284[4] Hoe Grass II[5]	Badge[5] Buctril M[5] 2,4-D Mextrol[5] Pardner[5]
	Established	2,4-D MCPA Amine[1]	MCPA Ester[1]			2,4-D MCPA Amine MCPA Ester
Timothy	Seedling	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5]	Caliber 400[1] 2,4-D Embutox 625[1] Mextrol[5]	Pardner[5] SEE 2,4-DB[1] Sword Target		Badge[5] Buctril M[5] 2,4-D Mextrol[5] Pardner[5]
	Established	Badge Buctril M 2,4-D	MCPA Amine[1] MCPA Ester[1] Mextrol			Badge Buctril M 2,4-D MCPA Amine MCPA Ester Mextrol
Hay and Grazing	With Legumes	Caliber 400[1] Cobutox 600[1]	Embutox 625[1] SEE 2,4-DB[1]			
	No Legumes	Banvel II & Mixes[4] 2,4-D[4] MCPA Amine[1,4]	MCPA Ester[1,4] MCPA Na-salt[4]			2,4-D[4] MCPA Amine[4] MCPA Ester[4] MCPA Na-salt[4]

[1] Suppression only
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[5] Seed production only
[6] Spot treatment only

Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Burdock	Canada Thistle			Cleavers
Smooth Brome	Seeding		Badge[1,5] Banvel II & Mixes Basagran[1,5] Buctril M[1,5] Caliber 400[1]	2,4-D[1] Embutox 625[1] Glyphosate[6*] Lontrel	Mextrol[1,5] SEE 2,4-DB[1] Sword Target[1]	Banvel II & Mixes[1] Basagran Sword Target
	Established		2,4-D[1] Glyphosate[6*]	Lontrel MCPA Amine[1]	MCPA Ester[1]	
Crested Wheatgrass	Seeding		Badge[1,5] Banvel II & Mixes Basagran[1,5] Buctril M[1,5] Caliber 400[1]	2,4-D[1] Embutox 625[1] Glyphosate[6*] Lontrel	Mextrol[1,5] SEE 2,4-DB[1] Sword Target[1]	Banvel II & Mixes[1] Basagran Sword Target
	Established		Ally[1] 2,4-D[1]	Glyphosate[6*] Lontrel	MCPA Amine[1] MCPA Ester[1]	
Intermediate Wheatgrass	Seeding		Badge[1,5] Banvel II & Mixes Buctril M[1,5] Caliber 400[1] 2,4-D[1]	Embutox 625[1] Glyphosate[6*] Lontrel Mextrol[1,5]	SEE 2,4-DB[1] Sword Target[1] Triumph Plus[1]	Banvel II & Mixes[1] Sword Target
	Established		Ally[1] 2,4-D[1]	Glyphosate[6*] Lontrel	MCPA Amine[1] MCPA Ester[1]	
Creeping Red Fescue	Seeding		Badge[1,5] Banvel II & Mixes[1] Basagran[1,5] Buctril M[1,5] Caliber 400[1]	2,4-D[1] Embutox 625[1] Glyphosate[6*] Lontrel Mextrol[1,5]	SEE 2,4-DB[1] Sword Target[1] Triumph Plus[1]	Banvel II + 2,4-D[1] Basagran Sword Target
	Established		Ally[1] Banvel II + 2,4-D 2,4-D[1]	Glyphosate[6*] Lontrel MCPA Amine[1]	MCPA Ester[1] Mextrol[1,5]	Banvel II + 2,4-D[1]
Russian Wild Rye	Seeding		Badge[1,5] Buctril M[1,5]	2,4-D[1] Glyphosate[6*]	Lontrel Mextrol[1,5]	
	Established		2,4-D[1] Glyphosate[6*]	Lontrel MCPA Amine[1]	MCPA Ester[1]	
Timothy	Seeding		Badge[1,5] Banvel II & Mixes Basagran[1,5] Buctril M[1,5]	2,4-D[1] Embutox 625[1] Glyphosate[6*] Lontrel	Mextrol[1,5] Sword Target[1]	Banvel II & Mixes[1] Basagran Sword Target
	Established		Badge[1] Buctril M[1] 2,4-D[1]	Glyphosate[6*] Lontrel MCPA Amine[1]	Mextrol[1] MCPA Ester[1]	
Hay and Grazing	With Legumes		Amitrol 240[6] Caliber 400[1] Clovitox Plus[1]	Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1]	Topside[1] Tropotox Plus[1]	
	No Legumes	Grazon	Amitrol 240[4,6] Banvel II & Mixes[1,4] Clovitox Plus[1] 2,4-D[1,4]	Grazon MCPA Amine[1,4] MCPA Ester[1,4] MCPA Na-salt[1,4]	Topside[1] Tropotox Plus[1] Tordon 22K[4]	Banvel II & Mixes[4]

[1] Suppression only
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[5] Seed production only
[6] Spot treatment only

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Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Clovers	Common Chickweed	Common Groundsel	Common Ragweed	Corn Spurry
Smooth Brome	Seedling	Lontrel	Basagran[5] Triumph Plus	Badge[5] Basagran[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5]		Banvel II & Mixes Basagran[5] Sword Target Triumph Plus
	Established	Lontrel				
Crested Wheatgrass	Seedling	Lontrel	Basagran[5]	Badge[5] Basagran[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5]	Badge[5] Buctril M[5] Mextrol[5]	Banvel II & Mixes Basagran[5] Sword Target
	Established	Lontrel	Ally	Ally		Ally[1]
Intermediate Wheatgrass	Seedling	Lontrel	Triumph Plus	Badge[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5]	Badge Buctril M Mextrol	Banvel II & Mixes Sword Target Triumph Plus
	Established	Lontrel	Ally	Ally		Ally[1]
Creeping Red Fescue	Seedling	Banvel II Lontrel	Basagran[5] Triumph Plus	Badge[5] Basagran[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5]	Badge Buctril M Mextrol	Banvel II + 2,4-D Basagran[5] Sword Target Triumph Plus
	Established	Banvel II Lontrel	Ally	Ally		Ally Banvel II + 2,4-D
Russian Wild Rye	Seedling	Lontrel		Badge[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5]	Badge Buctril M Mextrol	
	Established	Lontrel				
Timothy	Seedling	Lontrel (Alsike only)	Basagran[5]	Badge[5] Basagran[5] Buctril M[5] Mextrol[5] Pardner[5]	Badge Buctril M Mextrol	Banvel II & Mixes Basagran[5] Sword Target
	Established	Lontrel (Alsike only)		Badge Buctril M Mextrol	Badge Buctril M Mextrol	
Hay and Grazing	With Legumes		Kerb[4]			
	No Legumes	Banvel II & Mixes[4] Grazon	Kerb[4]		Grazon	Banvel II & Mixes[4]

[1] Suppression only
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[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Cow Cockle		Dandelion	Field Bindweed	
Smooth Brome	Seedling	Badge[5] Banvel II & Mixes Buctril M[5] Hoe Grass II[5] Mextrol[5]	Pardner[5] Target Sword Triumph Plus	Caliber 400 2,4-D[1] Embutox 625[1] SEE 2,4-DB	Basagran[1,5] 2,4-D[1] Glyphosate[6]*	Sword Target[1]
	Established			2,4-D[1] MCPA Amine[1] MCPA Ester[1]	2,4-D[1] Glyphosate[6]*	MCPA Amine[1] MCPA Ester[1]
Crested Wheatgrass	Seedling	Badge[5] Banvel II & Mixes Buctril M[5] Hoe Grass II[5]	Mextrol[5] Pardner[5] Sword Target	2,4-D[1] Embutox 625[1]	Basagran[1,5] 2,4-D[1] Glyphosate[6]*	Sword Target[1]
	Established	Ally		2,4-D[1] MCPA Amine[1] MCPA Ester[1]	2,4-D[1] Glyphosate[6]*	MCPA Amine[1] MCPA Ester[1]
Intermediate Wheatgrass	Seedling	Badge[5] Banvel II & Mixes Buctril M[5] Hoe Grass II[5] Mextrol[5]	Pardner[5] Sword Target Triumph Plus	Caliber 400[1] 2,4-D[1] Embutox 625[1] SEE 2,4-DB[1]	2,4-D[1] Glyphosate[6]*	
	Established	Ally		2,4-D[1] MCPA Amine[1] MCPA Ester[1]	2,4-D[1] Glyphosate[6]*	MCPA Amine[1] MCPA Ester[1]
Creeping Red Fescue	Seedling	Badge[5] Banvel II + 2,4-D Buctril M[5] Hoe Grass II[5]	Mextrol[5] Pardner[5] Triumph Plus	Banvel II + 2,4-D[1] 2,4-D[1] Embutox 625[1]	Basagran[1,5] 2,4-D[1] Glyphosate[6]*	Sword Target[1]
	Established	Ally Banvel II + 2,4-D		Banvel II + 2,4-D[1] 2,4-D[1] MCPA Amine[1] MCPA Ester[1]	2,4-D[1] Banvel II + 2,4-D[1] Glyphosate[6]*	MCPA Amine[1] MCPA Ester[1]
Russian Wild Rye	Seedling	Badge[5] Buctril M[5] Hoe Grass II[5]	Mextrol[5] Pardner[5]	2,4-D[1]	2,4-D[1] Glyphosate[6]*	
	Established			2,4-D[1] MCPA Amine[1] MCPA Ester[1]	2,4-D[1] Glyphosate[6]*	MCPA Amine[1] MCPA Ester[1]
Timothy	Seedling	Badge[5] Banvel II & Mixes Buctril M[5] Mextrol[5]	Pardner[5] Sword Target	Caliber 400 2,4-D[1] Embutox 625[1] SEE 2,4-DB	Basagran[1,5] 2,4-D[1] Glyphosate[6]*	Sword Target[1]
	Established	Badge Buctril M Mextrol		2,4-D[1] MCPA Amine[1] MCPA Ester[1]	2,4-D[1] Glyphosate[6]*	MCPA Amine[1] MCPA Ester[1]
Hay and Grazing	With Legumes			Caliber 400[1] Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1]	Caliber 400[1] Clovitox Plus[1] Cobutox 600[1] Embutox 625[1]	SEE 2,4-DB[1] Topside[1] Tropotox Plus[1]
	No Legumes	Banvel II & Mixes[4]		2,4-D[1,4] Grazon MCPA Amine[1,4] MCPA Ester[1,4]	Banvel II[1,4] Clovitox Plus[1] 2,4-D[1,4] MCPA Amine[1,4] MCPA Ester[1,4]	MCPA Na-salt[1,4] Topside[1] Tordon 22K[4] Tropotox Plus[1]

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Fleabane	Flixweed (seedlings)		Goldenrod	Green Foxtail
Smooth Brome	Seedling		Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D	Mextrol[5] Sword Target Triumph Plus		Achieve Liquid[6] Hoe Grass 284[4] Hoe Grass II[5] Triumph Plus
	Established		2,4-D MCPA Amine	MCPA Ester		Achieve Liquid[6]
Crested Wheatgrass	Seedling		Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D	Mextrol[5] Sword Target		Achieve Liquid[6] Hoe Grass 284[4] Hoe Grass II[5]
	Established		Ally 2,4-D	MCPA Amine MCPA Ester		Achieve Liquid[6]
Intermediate Wheatgrass	Seedling		Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D	Mextrol[5] Sword Target Triumph Plus		Achieve Liquid[6] Hoe Grass 284[4] Hoe Grass II[5] Triumph Plus
	Established		Ally 2,4-D	MCPA Amine MCPA Ester		Achieve Liquid[6]
Creeping Red Fescue	Seedling		Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D	Mextrol[5] Sword Target Triumph Plus		Achieve Liquid[6] Hoe Grass 284[4] Hoe Grass II[5] Poast Ultra[5] Triumph Plus Venture[5]
	Established		Ally 2,4-D[1]	MCPA Amine MCPA Ester		Achieve Liquid[6] Assure II[5] Poast Ultra[5] Venture[5]
Russian Wild Rye	Seedling		Badge[5] Buctril M[5]	2,4-D Mextrol[5]		Hoe Grass 284[4] Hoe Grass II[5]
	Established		2,4-D MCPA Amine	MCPA Ester		
Timothy	Seedling		Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D	Mextrol[5] Sword Target		
	Established		Badge Buctril M 2,4-D	MCPA Amine MCPA Ester Mextrol		Achieve Liquid
Hay and Grazing	With Legumes					
	No Legumes	Grazon	2,4-D[4] MCPA Amine[4]	MCPA Ester[4]	Grazon	

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Hemp-nettle	Kochia		Lamb's-quarters		
Smooth Brome	Seedling	Sword Target Triumph Plus	Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D Hoe Grass II[5]	Mextrol[5] Pardner[5] Sword Target Triumph Plus	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400	2,4-D Embutox 625 Hoe Grass II[5] Mextrol[5] Pardner[5]	SEE 2,4-DB Sword Target Triumph Plus
	Established	MCPA Amine[1] MCPA Ester[1]	2,4-D MCPA Amine	MCPA Ester	2,4-D MCPA Amine	MCPA Ester	
Crested Wheatgrass	Seedling	Sword Target	Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D Hoe Grass II[5]	Mextrol[5] Pardner[5] Sword Target	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400	2,4-D Embutox 625 Hoe Grass II[5] Mextrol[5]	Pardner[5] SEE 2,4-DB Sword Target
	Established	Ally MCPA Amine[1] MCPA Ester[1]	Ally 2,4-D	MCPA Amine MCPA Ester	Ally 2,4-D	MCPA Amine MCPA Ester	
Intermediate Wheatgrass	Seedling	Sword Target Triumph Plus	Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D Hoe Grass II[5]	Mextrol[5] Pardner[5] Sword Target Triumph Plus	Badge[5] Banvel II & Mixes Buctril M[5] Caliber 400 2,4-D	Embutox 625 Hoe Grass II[5] Mextrol[5] Pardner[5]	SEE 2,4-DB Sword Target Triumph Plus
	Established	Ally MCPA Amine[1] MCPA Ester[1]	Ally 2,4-D	MCPA Amine MCPA Ester	Ally 2,4-D	MCPA Amine MCPA Ester	
Creeping Red Fescue	Seedling	Sword Target Triumph Plus	Badge[5] Banvel II + 2,4-D Buctril M[5] 2,4-D Hoe Grass II[5]	Mextrol[5] Pardner[5] Sword Target Triumph Plus	Badge[5] Banvel II + 2,4-D Basagran[5] Buctril M[5] Caliber 400	2,4-D Embutox 625 Hoe Grass II[5] Mextrol[5] Pardner[5]	SEE 2,4-DB Sword Target Triumph Plus
	Established	Ally MCPA Amine[1] MCPA Ester[1]	Ally Banvel II + 2,4-D 2,4-D	MCPA Amine MCPA Ester	Ally[1] Banvel II + 2,4-D 2,4-D	MCPA Amine MCPA Ester	
Russian Wild Rye	Seedling		Badge[5] Buctril M[5] 2,4-D	Hoe Grass II[5] Mextrol[5] Pardner[5]	Badge[5] Buctril M[5] 2,4-D	Hoe Grass II[5] Mextrol[5] Pardner[5]	
	Established	MCPA Amine[1] MCPA Ester[1]	2,4-D MCPA Amine	MCPA Ester	2,4-D MCPA Amine	MCPA Ester	
Timothy	Seedling	Sword Target	Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D	Mextrol[5] Pardner[5] Sword Target	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5]	Caliber 400 2,4-D Embutox 625 Mextrol[5]	Pardner[5] SEE 2,4-DB Sword Target
	Established	MCPA Amine[1] MCPA Ester[1]	Badge Buctril M 2,4-D	MCPA Amine MCPA Ester Mextrol	Badge Buctril M 2,4-D	MCPA Amine MCPA Ester Mextrol	
Hay and Grazing	With Legumes	Clovitox Plus[1] Topside[1] Tropotox Plus[1]			Caliber 400 Clovitox Plus Cobutox 600	Embutox 625 SEE 2,4-DB	Topside Tropotox Plus
	No Legumes	Clovitox Plus[1] MCPA Amine[1] MCPA Ester[1] MCPA Na-salt[1] Topside[1] Tropotox Plus[1]	2,4-D[4] MCPA Amine[4] MCPA Ester[4]		Clovitox Plus 2,4-D[4] MCPA Amine[4] MCPA Ester[4]	MCPA Na-salt[4] Topside Tropotox Plus	

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Leafy Spurge	Mustards			Narrow-leaved Hawk's-beard
Smooth Brome	Seeding	2,4-D[1]	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400	2,4-D Embutox 625 Hoe Grass II[5] Mextrol[5] Pardner[5]	SEE 2,4-DB Sword Target Triumph Plus	2,4-D[1]
	Established	2,4-D[1] MCPA Amine[1] MCPA Ester[1]	2,4-D MCPA Amine	MCPA Ester		2,4-D[1]
Crested Wheatgrass	Seeding	2,4-D[1]	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400	2,4-D Embutox 625 Hoe Grass II[5] Mextrol[5]	Pardner[5] SEE 2,4-DB Sword Target	2,4-D[1]
	Established	2,4-D[1] MCPA Amine[1] MCPA Ester[1]	Ally 2,4-D	MCPA Amine MCPA Ester		2,4-D[1]
Intermediate Wheatgrass	Seeding	2,4-D[1]	Badge[5] Banvel II & Mixes Buctril M[5] Caliber 400 2,4-D	Embutox 625 Hoe Grass II[5] Mextrol[5] Pardner[5]	SEE 2,4-DB Sword Target Triumph Plus	2,4-D[1]
	Established	2,4-D[1] MCPA Amine[1] MCPA Ester[1]	Ally 2,4-D	MCPA Amine MCPA Ester		2,4-D[1]
Creeping Red Fescue	Seeding	2,4-D[1]	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400	2,4-D Embutox 625 Hoe Grass II[5] Mextrol[5] Pardner[5]	SEE 2,4-DB Sword Target Triumph Plus	2,4-D[1]
	Established	2,4-D[1] MCPA Amine[1] MCPA Ester[1]	Ally Banvel II + 2,4-D	2,4-D MCPA Amine	MCPA Ester	2,4-D[1]
Russian Wild Rye	Seeding	2,4-D[1]	Badge[5] Buctril M[5]	2,4-D Hoe Grass II[5]	Mextrol[5] Pardner[5]	2,4-D[1]
	Established	2,4-D[1] MCPA Amine[1] MCPA Ester[1]	Ally[5] 2,4-D	MCPA Amine MCPA Ester		2,4-D[1]
Timothy	Seeding	2,4-D[1]	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5]	Caliber 400 2,4-D Embutox 625 Mextrol[5]	Pardner[5] SEE 2,4-DB Sword Target	2,4-D[1]
	Established	2,4-D[1] MCPA Amine[1] MCPA Ester[1]	Badge Buctril M 2,4-D	MCPA Amine MCPA Ester Mextrol		2,4-D[1]
Hay and Grazing	With Legumes	Amitrol 240[4,6]	Caliber 400 Clovitox Plus Cobutox 600 Embutox 625	SEE 2,4-DB Topside Tropotox Plus		Caliber 400 Cobutox 600 Embutox 625 (fall spraying) SEE 2,4-DB
	No Legumes	Amitrol 240[4,5] 2,4-D[1,4] MCPA Amine[1,4] MCPA Ester[1,4] MCPA Na-salt[1,4] Tordon 22K[4]	Banvel II & Mixes Clovitox Plus 2,4-D[4] MCPA Amine[4]	MCPA Ester[4] MCPA Na-salt[4] Topside Tropotox Plus		2,4-D[1] (fall spraying)

[1] Suppression only

[2] Pre-crop emergence to weed seedlings

[3] Used as a crop desiccant

[4] Grazing or feeding restrictions

[5] Seed production only

Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Night-flowering Catchfly	Perennial Sow-thistle			Plantain	Prickly Lettuce
Smooth Brome	Seeding	Badge[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5] Sword Target	Badge[1,5] Banvel II & Mixes Buctril M[1,5] Caliber 400[1]	2,4-D[1] Embutox 625[1] Glyphosate[6]* Lontrel[1]	Mextrol[1,5] SEE 2,4-DB[1] Sword Target[1]		
	Established		2,4-D[1] Glyphosate[6]*	Lontrel[1] MCPA Amine[1]	MCPA Ester[1]		
Crested Wheatgrass	Seeding	Badge[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5] Sword Target	Badge[1,5] Banvel II & Mixes Buctril M[1,5] Caliber 400[1]	2,4-D[1] Embutox 625[1] Glyphosate[6]* Lontrel[1]	Mextrol[1,5] SEE 2,4-DB[1] Sword Target[1]		
	Established		Ally[1] 2,4-D[1]	Glyphosate[6]* Lontrel[1]	MCPA Amine[1] MCPA Ester[1]		
Intermediate Wheatgrass	Seeding	Badge[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5] Sword Target	Badge[1,5] Banvel II & Mixes Buctril M[1,5] Caliber 400[1]	2,4-D[1] Embutox 625[1] Glyphosate[6]* Lontrel[1]	Mextrol[1,5] SEE 2,4-DB[1] Sword Target[1]		
	Established		Ally[1] 2,4-D[1]	Glyphosate[6]* Lontrel[1]	MCPA Amine[1] MCPA Ester[1]		
Creeping Red Fescue	Seeding	Badge[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5] Sword Target	Badge[1,5] Banvel II + 2,4-D[1] Buctril M[1,5] Caliber 400[1]	2,4-D[1] Embutox 625[1] Glyphosate[6]* Lontrel[1]	Mextrol[1,5] SEE 2,4-DB[1] Sword Target[1]		
	Established		Ally Banvel II + 2,4-D[1] 2,4-D[1]	Glyphosate[6]* Lontrel[1]	MCPA Amine[1] MCPA Ester[1]		
Russian Wild Rye	Seeding	Badge[5] Buctril M[5] Hoe Grass II[5] Mextrol[5] Pardner[5]	Badge[1,5] Buctril M[1,5]	2,4-D[1] Glyphosate[6]*	Lontrel[1] Mextrol[1,5]		
	Established		2,4-D[1] Glyphosate[6]*	Lontrel[1] MCPA[1]			
Timothy	Seeding	Badge[5] Buctril M[5] Mextrol[5] Pardner[5] Sword Target	Badge[1,5] Banvel II & Mixes Buctril M[1,5] Caliber 400[1]	2,4-D[1] Embutox 625[1] Glyphosate[6]* Lontrel[1]	Mextrol[1,5] SEE 2,4-DB[1] Sword Target[1]		
	Established	Badge Buctril M Mextrol	Badge Buctril M 2,4-D[1]	Glyphosate[6]* Lontrel[1] MCPA Amine	MCPA Ester[1] Mextrol		
Hay and Grazing	With Legumes		Amitrol 240[4,6] Caliber 400[1] Clovitox Plus[1]	Cobutox 600[1] Embutox 625[1] SEE 2,4-DB[1]	Topside[1] Tropotox Plus[1]		
	No Legumes		Amitrol 240[4,6] Banvel II & Mixes[1,4] Clovitox Plus[1] 2,4-D[1,4]	MCPA Amine[1,4] MCPA Ester[1,4] MCPA Na-salt[1,4]	Topside[1] Tropotox Plus[1] Tordon 22K[4]	Grazon	Grazon

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[5] Seed production only
[6] Spot treatment only

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Quack Grass	Redroot Pigweed		Russian Thistle	
Smooth Brome	Seeding	Glyphosate[5]*	Badge[5] Banvel II & Mixes Basagran[1,5] Buctril M[5] Caliber 400 2,4-D Embutox 625	Hoe Grass II[5] Mextrol[5] Pardner[5] SEE 2,4-DB Sword Target Triumph Plus	Badge[5] Banvel II + 2,4-D Basagran[5] Buctril M[5] 2,4-D	Hoe Grass II[5] Mextrol[5] Pardner[5] Sword Target
	Established	Glyphosate[6]*	2,4-D MCPA Amine	MCPA Ester[1]	2,4-D	
Crested Wheatgrass	Seeding	Glyphosate[5]*	Badge[5] Banvel II & Mixes Basagran[1,5] Buctril M[5] Caliber 400 2,4-D Embutox 625	Hoe Grass II[5] Mextrol[5] Pardner[5] SEE 2,4-DB Sword Target	Badge[5] Banvel II + 2,4-D Basagran[5] Buctril M[5] 2,4-D	Hoe Grass II[5] Mextrol[5] Pardner[5] Sword Target
	Established	Glyphosate[6]*	Ally 2,4-D	MCPA Amine MCPA Ester[1]	Ally[1] 2,4-D	
Intermediate Wheatgrass	Seeding	Glyphosate[5]*	Badge[5] Banvel II & Mixes Buctril M[5] Caliber 400 2,4-D Embutox 625 Hoe Grass II[5]	Mextrol[5] Pardner[5] SEE 2,4-DB Sword Target Triumph Plus	Badge[5] Banvel II + 2,4-D Buctril M[5] 2,4-D Hoe Grass II[5]	Mextrol[5] Pardner[5] Sword Target Triumph Plus
	Established	Glyphosate[6]*	Ally 2,4-D	MCPA Amine MCPA Ester[1]	Ally[1] 2,4-D	
Creeping Red Fescue	Seeding	Glyphosate[5]* Poast Ultra[5] Venture[5]	Badge[5] Banvel II & Mixes Basagran[1,5] Buctril M[5] Caliber 400 2,4-D	Embutox 625 Hoe Grass II[5] Mextrol[5] Pardner[5] SEE 2,4-DB Triumph Plus	Badge[5] Banvel II + 2,4-D Basagran[5] Buctril M[5] 2,4-D Hoe Grass II[5]	Mextrol[5] Pardner[5] Sword Target Triumph Plus
	Established	Assure II[5] Glyphosate[5]* Poast Ultra[5] Venture[5]	Ally Banvel II + 2,4-D 2,4-D	MCPA Amine MCPA Ester[1]	Ally[1] Banvel II + 2,4-D	2,4-D
Russian Wild Rye	Seeding	Glyphosate[5]*	Badge[5] Buctril M[5] 2,4-D	Hoe Grass II[5] Mextrol[5] Pardner[5]	Badge[5] Buctril M[5] 2,4-D	Hoe Grass II[5] Mextrol[5] Pardner[5]
	Established	Glyphosate[6]*	2,4-D MCPA Amine	MCPA Ester[1]	2,4-D	
Timothy	Seeding	Glyphosate[5]*	Badge[5] Banvel II & Mixes Basagran[1,5] Buctril M[5] Caliber 400 2,4-D	Embutox 625 Mextrol[5] Pardner[5] SEE 2,4-DB Sword Target	Badge[5] Banvel II + 2,4-D Basagran[5] Buctril M[5] 2,4-D	Mextrol[5] Pardner[5] Sword Target
	Established	Glyphosate[6]*	Badge Buctril M 2,4-D	MCPA Amine MCPA Ester[1] Mextrol	Badge Buctril M	2,4-D Mextrol
Hay and Grazing	With Legumes	Amitrol 240[4,6] Glyphosate[6]* Kerb[4]	Caliber 400 Clovitox Plus Cobutox 600 Embutox 625	SEE 2,4-DB Topside Tropotox Plus		
	No Legumes	Amitrol 240[4,6] Glyphosate[6]* Kerb[4]	Banvel II & Mixes Clovitox Plus 2,4-D[4] MCPA Amine[4]	MCPA Ester[4] MCPA Na-salt[4] Topside Tropotox Plus	Banvel II + 2,4-D 2,4-D[4]	Sword Target

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[2] Pre-crop emergence to weed seedlings
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[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Scentless Chamomile (seedlings)	Shepherd's-purse (seedlings)		Stinkweed (seedlings)	
Smooth Brome	Seeding	Badge[5] Buctril M[5] Hoe Grass II[5] Lontrel Mextrol[5] Pardner[5]	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400 2,4-D	Embutox 625 Mextrol[5] SEE 2,4-DB Sword Target Triumph Plus	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400 2,4-D Embutox 625	Hoe Grass II[5] Mextrol[5] Pardner[5] SEE 2,4-DB Sword Target Triumph Plus
	Established	Lontrel	2,4-D MCPA Amine	MCPA Ester	2,4-D MCPA Amine	MCPA Ester
Crested Wheatgrass	Seedling	Badge[5] Buctril M[5] Hoe Grass II[5] Lontrel Mextrol[5] Pardner[5]	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400 2,4-D	Embutox 625 Mextrol[5] SEE 2,4-DB Sword Target	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400 2,4-D Embutox 625	Hoe Grass II[5] Mextrol[5] Pardner[5] SEE 2,4-DB Sword Target
	Established	Ally Lontrel	Ally[1] 2,4-D	MCPA Amine MCPA Ester	Ally[1] 2,4-D	MCPA Amine MCPA Ester
Intermediate Wheatgrass	Seeding	Badge[5] Buctril M[5] Hoe Grass II[5] Lontrel Mextrol[5] Pardner[5]	Badge[5] Banvel II & Mixes Buctril M[5] Caliber 400 2,4-D Embutox 625	Mextrol[5] SEE 2,4-DB Sword Target Triumph Plus	Badge[5] Banvel II & Mixes Buctril M[5] Caliber 400 2,4-D Embutox 625 Hoe Grass II[5]	Mextrol[5] Pardner[5] SEE 2,4-DB Sword Target Triumph Plus
	Established	Ally Lontrel	Ally[1] 2,4-D	MCPA Amine MCPA Ester	Ally[1] 2,4-D	MCPA Amine MCPA Ester
Creeping Red Fescue	Seeding	Badge[5] Buctril M[5] Hoe Grass II[5] Lontrel Mextrol[5] Pardner[5]	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400	2,4-D Embutox 625 Mextrol[5] SEE 2,4-DB Triumph Plus	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Hoe Grass II[5] 2,4-D	Mextrol[5] Pardner[5] Sword Target Triumph Plus
	Established	Ally Lontrel	Ally Banvel II + 2,4-D 2,4-D	MCPA Amine MCPA Ester	Ally Banvel II + 2,4-D 2,4-D	MCPA Amine MCPA Ester
Russian Wild Rye	Seeding	Badge[5] Buctril M[5] Hoe Grass II[5] Lontrel Mextrol[5] Pardner[5]	Badge[5] Buctril M[5]	2,4-D Mextrol[5]	Badge[5] Buctril M[5] 2,4-D	Hoe Grass II[5] Mextrol[5] Pardner[5]
	Established	Lontrel	2,4-D MCPA Amine	MCPA Ester	2,4-D MCPA Amine	MCPA Ester
Timothy	Seeding	Badge[5] Buctril M[5] Lontrel Mextrol[5] Pardner[5]	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400 2,4-D	Embutox 625 Mextrol[5] SEE 2,4-DB Sword Target	Badge[5] Banvel II & Mixes Basagran[5] Buctril M[5] Caliber 400 2,4-D	Embutox 625 Mextrol[5] Pardner[5] SEE 2,4-DB Sword Target
	Established	Badge Buctril M Lontrel Mextrol	Badge Buctril M 2,4-D	MCPA Amine MCPA Ester Mextrol	Badge Buctril M 2,4-D	MCPA Amine MCPA Ester Mextrol
Hay and Grazing	With Legumes		Caliber 400 Clovitox Plus Cobutox 600 Embutox 625	SEE 2,4-DB Topside Tropotox Plus	Cobutox 600 Caliber 400 Clovitox Plus Embutox 625	SEE 2,4-DB Topside Tropotox Plus
	No Legumes	Tordon 22K[4]	Banvel II & Mixes Clovitox Plus 2,4-D[4] MCPA Amine[4]	MCPA Ester[4] MCPA Na-salt[4] Topside Tropotox Plus	Banvel II & Mixes Clovitox Plus 2,4-D[4] MCPA Amine[4]	MCPA Ester[4] MCPA Na-salt[4] Topside Tropotox Plus

[1] Suppression only

[2] Pre-crop emergence to weed seedlings

[3] Used as a crop desiccant

[4] Grazing or feeding restrictions

[5] Seed production only

Herbicide Selector Chart – Forage Grasses

Crop	Crop Stage	Toadflax	Wild Buckwheat		Wild Oats	
Smooth Brome	Seeding	Glyphosate[2]*	Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D Amine[1] Embutox 625 Hoe Grass II[5]	Lontrel Mextrol[5] Pardner Sword Target Triumph Plus	Achieve Liquid[5] Avenge Hoe-Grass 284[4]	Hoe Grass II[5] Triumph Plus
	Established	Glyphosate[6]*	2,4-D Amine[1] Lontrel	MCPA Amine[1] MCPA Ester[1]	Achieve Liquid[5]	
Crested Wheatgrass	Seeding	Glyphosate[2]*	Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D Amine[1] Embutox 625 Hoe Grass II[5]	Lontrel Mextrol[5] Pardner[5] Sword Target	Achieve Liquid[5] Avenge	Hoe-Grass 284[4] Hoe Grass II[5]
	Established	Glyphosate[6]*	Ally 2,4-D Amine[1] Lontrel	MCPA Amine[1] MCPA Ester[1]	Achieve Liquid[5]	
Intermediate Wheatgrass	Seeding	Glyphosate[2]*	Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D Amine[1] Embutox 625 Hoe Grass II[5]	Lontrel Mextrol[5] Pardner[5] Sword Target Triumph Plus	Achieve Liquid[5] Hoe-Grass 284[4]	Hoe Grass II[5] Triumph Plus
–	Established	Glyphosate[6]*	Ally 2,4-D Amine[1] Lontrel	MCPA Amine[1] MCPA Ester[1]	Achieve Liquid[5]	
Creeping Red Fescue	Seeding	Glyphosate[2]*	Badge[5] Banvel II + 2,4-D Buctril M[5] 2,4-D Amine[1] Embutox 625 Hoe Grass II[5]	Lontrel Mextrol[5] Pardner[5] Sword Target Triumph Plus	Achieve Liquid[5] Avenge Hoe-Grass 284[4] Hoe Grass II[5]	Poast Ultra[5] Triumph Plus Venture[5]
	Established	Glyphosate[6]*	Ally[1] Banvel II & Mixes 2,4-D Amine[1]	Lontrel MCPA Amine[1] MCPA Ester[1]	Achieve Liquid[5] Assure II[5]	Poast Ultra[5] Venture[5]
Russian Wild Rye	Seeding	Glyphosate[2]*	Badge[5] Buctril M[5] 2,4-D Amine[1] Hoe Grass II[5]	Lontrel Mextrol[5] Pardner[5]	Avenge Hoe-Grass 284[4]	Hoe Grass II[5]
	Established	Glyphosate[6]*	2,4-D Amine[1] Lontrel	MCPA Amine[1] MCPA Ester[1]		
Timothy	Seeding	Glyphosate[2]*	Badge[5] Banvel II & Mixes Buctril M[5] 2,4-D Amine[1] Lontrel	Mextrol[5] Pardner[5] Sword Target	Avenge	
	Established	Glyphosate[6]*	Badge Buctril M 2,4-D Amine[1] Lontrel	MCPA Amine[1] MCPA Ester[1] Mextrol	Achieve Liquid[5]	
Hay and Grazing	With Legumes	Amitrol 240[4,6] Glyphosate[6]*	Caliber 400 Cobutox 600	Embutox 625 SEE 2,4-DB	Kerb[4]	
	No Legumes	Amitrol 240[4,6] Tordon 22K[4]	Banvel II & Mixes 2,4-D[1] MCPA Amine[1,4]	MCPA Ester[1,4] MCPA Na-salt[1,4]	Kerb[4]	

[1] Suppression only
[2] Pre-crop emergence to weed seedlings
[3] Used as a crop desiccant
[4] Grazing or feeding restrictions
[5] Seed production only
[6] Spot treatment only

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Other Crops

Crop	American Nightshade	Annual Smartweed			Annual Sow-thistle	
Beans – Dry, Snap	Edge[1] Gramoxone[2] Pursuit Reglone[3]	Amiben Basagran Edge	Gramoxone[2] Reglone[3]		Gramoxone[2] Reglone[3]	
Canary Grass	Badge Buctril M Mextrol Pardner	Badge Banvel II Buctril M	Mextrol Pardner	Sword Target	MCPA[1] Sword	Target
Carrots (C) and Parsnips	Gramoxone[2] (C)	Gramoxone[2] (C) Linuron 480	Lorox (C)		Gramoxone[2] (C) Linuron 480 (C) (seedling only)	Lorox (C)
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Badge Buctril M Dual II Magnum Gramoxone[2] Koril Mextrol Pardner Primextra	Atrazine Banvel II + 2,4-D (FC) Basagran Caliber 400 (FC) Cobutox 600[1] (FC) 2,4-D	DyVel DS Embutox 625 (FC) Gramoxone[2] Koril Laddok Linuron 480 (FC) Lorox L (FC)	MCPA Amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Pardner Primextra SEE 2,4-DB (FC)	Amitrol 240 (spot) Caliber 400[1] (FC) Clovitox Plus[1] (FC) Cobutox 600[1] (FC) 2,4-D[1] DyVel DS Embutox 625[1] (FC)	Gramoxone[2] Lorox L MCPA[1] (FC) MCPA K-salt (FC) SEE 2,4-DB (FC) Topside[1] (FC) Tropotox Plus[1] (FC)
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)	Roundup (RR) Factor (RR)			Roundup (RR) Factor (RR)	
Fababeans	Edge[1]	Basagran Edge[1]	Sencor + Edge Sencor + Treflan			
Lentils	Reglone[3]	Reglone[3] Sencor			Reglone[3]	
Peas – Field and Processing Check label to ensure chosen chemical or mix is registered for use on the crop.	Edge[1] Gramoxone[2] Reglone[3]	Basagran Edge[1] Gramoxone[2]	MCPA Amine MCPA Na-salt Odyssey	Pursuit Reglone[3] Sencor	Amitrol 240 (spot) Clovitox Plus[1] Gramoxone[2] MCPA Amine[1]	MCPA Na-salt[1] Reglone[3] Topside[1] Tropotox Plus[1]
Potatoes	Dual II Magnum Gramoxone[2] Reglone[3]	Gramoxone[2] Linuron 480	Lorox Reglone[3]	Sencor	Gramoxone[2] Linuron 480 (seedling only)	Lorox L Reglone[3]
Rutabagas	Gramoxone[2]	Gramoxone[2]			Gramoxone[2]	
Tame Buckwheat						

[1] Suppression only
[2] Pre-emergence to crop, post-emergent to weeds
[3] Used as a crop desiccant

Herbicide Selector Chart – Other Crops

Crop	Barnyard Grass		Black Nightshade	Canada Thistle		Cleavers
Beans – **Dry, Snap**	Advance 10G Bonanza Centurion Edge Eptam Gramoxone[2]	Hoe Grass 284 Poast Ultra Reglone[3] Rival 500/DF Select Treflan	Edge[1] Gramoxone[2] Pursuit Reglone[3]	Amitrol 240 (spot) Basagran[1] Gramoxone[1,2] Reglone[3]		Basagran
Canary Grass			Pardner	Badge[1] Banvel II + MCPA[1] Buctril M[1]	Mextrol[1] Sword Target	
Carrots (C) and Parsnips	Gramoxone[2] (C) Hoe Grass 284 Linuron 480 L	Lorox (C) Rival 500/DF (C) Treflan	Gramoxone[2] (C)	Gramoxone[2] (C)[1]		
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Accent (FC) Atrazine Bladex Dual II Magnum Eradicane 8-E	Gramoxone[2] Lorox L (FC) Primextra Princep	Badge Bladex Buctril M Dual II Magnum Gramoxone[2] Koril Laddok Mextrol Pardner	Amitrol 240 (spot) Badge[1] Banvel II + 2,4-D (FC) Basagran[1] Buctril M[1] Caliber 400[1] (FC) Clovitox Plus[1] (FC) Cobutox 600[1] (FC) 2,4-D[1]	DyVel DS Embutox 625[1] (FC) Gramoxone[1,2] MCPA Amine[1] (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC) SEE 2,4-DB[1] (FC) Mextrol[1] Topside[1] (FC) Tropotox Plus[1] (FC)	Banvel II (FC)[1] Basagran Odyssey
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)		Roundup (RR) Factor (RR)	Roundup (RR) Factor (RR)		Roundup (RR) Factor (RR)
Fababeans	Advance 10G Bonanza Edge Hoe-Grass 284	Poast Ultra Reglone[3] Rival Treflan	Edge[1]	Basagran[1] Sencor[1]		Basagran
Lentils	Advance 10G Assure II Bonanza Centurion Fusion Hoe-Grass 284	Poast Ultra Reglone[3] Rival Select Treflan Venture	Reglone[3]	Glyphosate* (pre-harvest) Reglone[3] Sencor[1]		
Peas – **Field and Processing** Check label to ensure chosen chemical or mix is registered for use on the crop.	Advance 10G Assure II Bonanza Centurion Edge Fusion Gramoxone[2] Hoe-Grass 284	Odyssey Poast Ultra Reglone[3] Rival Select Treflan Venture	Edge[1] Gramoxone[2] Reglone[3]	Amitrol 240 (spot) Basagran[1] Clovitox Plus[1] Glyphosate* (pre-harvest) Gramoxone[1,2]	MCPA Amine[1] MCPA Na-salt[1] Reglone[3] Sencor[1] Topside[1] Tropotox Plus[1]	Basagran Odyssey Pursuit
Potatoes	Centurion Dual II Magnum Eptam (Irish) Gramoxone[2] Hoe-Grass 284 Linuron 480 L	Lorox Poast Ultra Prism (irr) Reglone[3] Select Venture	Dual II Magnum Gramoxone[2] Reglone[3]	Gramoxone[2] Reglone[3]		
Rutabagas	Bonanza Eptam Gramoxone[2]	Rival 500/DF Treflan	Gramoxone[2]	Gramoxone[2]		
Tame Buckwheat	Hoe-Grass Poast Ultra					

[1] Suppression only

[2] Pre-emergence to crop, post-emergent to weeds

[3] Used as a crop desiccant

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Other Crops

Crop	Cocklebur		Common Chickweed		Common Groundsel	Corn Spurry
Beans – Dry, Snap	Basagran Gramoxone[2] Reglone[3]		Advance 10G Basagran Bonanza Edge Eptam	Gramoxone[2] Patoran Reglone[3] Rival 500/DF Treflan	Basagran Gramoxone[2] Reglone[3]	Basagran Edge Eptam Gramoxone[2] Reglone[3]
Canary Grass	Badge Banvel II + MCPA Buctril M	MCPA Amine MCPA Ester Mextrol			Badge Buctril M Mextrol Pardner	Banvel II MCPA K-salt Sword Target
Carrots (C) and Parsnips	Gramoxone[2] (C)		Bonanza (C) Lorox (C) Linuron 480 L	Rival 500/DF Treflan (C)	Gramoxone[2] (C) Linuron 480 L	Gramoxone[2] (C)
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Badge Banvel II + 2,4-D (FC) Basagran Buctril M Cobotox 600 (FC) 2,4-D Caliber 400 (FC) DyVel DS	Embutox 625 (FC) Gramoxone[2] Laddok MCPA Amine[1] (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC) Mextrol SEE 2,4-DB (FC)	Basagran Eradicane 8-E Gramoxone[1,2] Laddok	Lorox L (FC) Princep Simazine 80W	Badge Basagran Buctril M Gramoxone[2] Koril Laddok Mextrol Pardner	Banvel II + 2,4-D (FC) Basagran DyVel DS Eradicane 8-E Gramoxone[2] Laddok MCPA K-salt
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)		Roundup (RR) Factor (RR)			Roundup (RR) Factor (RR)
Fababeans	Basagran		Advance 10G Basagran Bonanza Edge	Rival Sencor Treflan	Basagran	Basagran Edge Sencor
Lentils	Reglone[3]		Advance 10G Bonanza Reglone[3]	Rival Sencor Treflan	Reglone[3] Sencor	Reglone[3] Sencor
Peas – Field and Processing Check label to ensure chosen chemical or mix is registered for use on the crop.	Basagran Gramoxone[2] MCPA Amine[1] MCPA Na-salt[1] Reglone[3]		Advance 10G Basagran Bonanza Edge Gramoxone[2] Odyssey	Pursuit Reglone[3] Rival Sencor Treflan	Basagran Gramoxone[2] Reglone[3] Sencor	Basagran Edge Gramoxone[2] Reglone[3] Sencor
Potatoes	Gramoxone[2] Reglone[3]		Eptam (Irish) Gramoxone[2] Linuron 480 L	Lorox Reglone[3] Sencor	Gramoxone[2] Linuron 480 L Reglone[3] Sencor	Eptam (Irish) Gramoxone[2] Reglone[3] Sencor
Rutabagas	Gramoxone[2]		Bonanza Eptam Gramoxone[2]	Rival 500/DF Treflan	Gramoxone[2]	Eptam Gramoxone[2]
Tame Buckwheat						

[1] Suppression only

[2] Pre-emergence to crop, post-emergent to weeds

[3] Used as a crop desiccant

Herbicide Selector Chart – Other Crops

Crop	Cow Cockle		Goosefoot		Green Foxtail	
Beans – **Dry, Snap**	Advance 10G Bonanza Edge Gramoxone[2]	Reglone[3] Rival 500/DF Treflan	Gramoxone[2] Reglone[3]		Advance 10G Bonanza Centurion Edge Eptam Gramoxone[2]	Hoe-Grass 284 Poast Ultra Reglone Rival 500/DF Select Treflan
Canary Grass	Badge Banvel II Buctril M Mextrol	Pardner Sword Target				
Carrots (C) and Parsnips	Bonanza (C) Gramoxone[2] (C) Rival 500/DF (C) Treflan (C)		Gramoxone[2] (C) Linuron 480 L Lorox (C)		Bonanza (C) Gramoxone[2] (C) Hoe-Grass 284 (C) Linuron 480 L	Lorox (C) Rival 500/DF (C) Treflan (C)
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Badge Banvel II + 2,4-D (FC) BuctrilL M DyVel DS	Gramoxone[2] (C) Koril Mextrol Pardner	Bladex Caliber 400 (FC) Cobutox 600 (FC) 2,4-D Amine Embutox 625 (FC)	Gramoxone[2] Lorox (FC) MCPA Amine[1] MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC) SEE 2,4-DB (FC)	Accent (FC) Atrazine Bladex Dual II Magnum	Eradicane 8-E Gramoxone[2] Lo[illegible] C) Primextra
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)				Roundup (RR) Factor (RR)	
Fababeans	Advance 10G Bonanza Edge	Rival Treflan			Advance 10G Bonanza Edge Hoe-Grass 284	Poast Ultra Rival Treflan
Lentils	Advance 10G Bonanza Reglone[3]	Rival Treflan	Reglone[3]		Advance 10G Assure II Bonanza Centurion Fusion Hoe-Grass 284	Poast Ultra Reglone[3] Rival Select Treflan Venture
Peas – **Field and Processing** Check label to ensure chosen chemical or mix is registered for use on the crop.	Advance 10G Bonanza Edge Gramoxone[2] Reglone[3] Rival Treflan		Gramoxone[2] MCPA Amine[1] MCPA Na-salt[1] Reglone[3]		Advance 10G Assure II Bonanza Centurion Edge Fusion Gramoxone[2] Hoe-Grass 284	Odyssey Poast Ultra Pursuit Reglone[3] Rival Select Treflan Venture
Potatoes **Irrigated (irr)**	Gramoxone[2] Reglone[3]		Gramoxone[2] Linuron 480 L Lorox Reglone[3]		Centurion Dual II Magnum Eptam (Irish) Gramoxone[2] Hoe-Grass 284 Linuron 480 L	Lorox[1] Poast Ultra Prism (irr) Reglone[3] Select Venture
Rutabagas	Bonanza Gramoxone[2]	Rival 500/DF Treflan	Gramoxone[2]		Bonanza Eptam Gramoxone[2]	Rival 500/DF Treflan
Tame Buckwheat					Hoe-Grass 284 Poast Ultra	

[1] Suppression only
[2] Pre-emergence to crop, post-emergent to weeds
[3] Used as a crop desiccant

Herbicide Selector Chart – Other Crops

Crop	Hairy Nightshade	Hemp-nettle	Knotweed		Kochia	
Beans – **Dry, Snap**	Basagran Eptam Gramoxone[2] Pursuit Reglone[3]	Gramoxone[2] Reglone[3] Edge[1]	Advance 10G Bonanza Gramoxone[2]	Reglone[3] Rival 500/DF Treflan	Edge Gramoxone[2] Reglone[3]	
Canary Grass		Sword Target	Sword Target		Badge Banvel II & Mixes Buctril M Mextrol	Pardner Sword Target
Carrots (C) and Parsnips	Gramoxone[2] (C)	Gramoxone[2] (C)	Bonanza (C) Lorox (C) Gramoxone[2] (C)	Linuron 480 Rival 500/DF (C) Treflan (C)	Gramoxone[2] (C) Linuron 480	
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Badge Basagran Buctril M Dual II Magnum Eradicane 8-E Gramoxone[2] Koril Mextrol	Gramoxone[2] MCPA Amine[1] (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC)	Bladex DyVel DS Gramoxone[2] Linuron 480 Lorox L (FC)		Badge Banvel II + 2,4-D (FC) Bladex Buctril M DyVel DS	2,4-D Gramoxone[2] MCPA Amine (FC) MCPA K-salt (FC) Mextrol Pardner
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)	Roundup (RR) Factor (RR)			Roundup (RR) Factor (RR)	
Fababeans	Basagran	Edge Sencor	Advance 10G Bonanza	Rival Treflan	Edge	
Lentils	Reglone[3]	Reglone[3] Sencor	Advance 10G Bonanza Reglone[3]	Rival Treflan	Reglone[3]	
Peas – **Field and Processing** Check label to ensure chosen chemical or mix is registered for use on the crop.	Basagran Gramoxone[2] Reglone[3]	Clovitox Plus[1] Edge[1] Gramoxone[2] Lexone DF MCPA Amine[1] MCPA Na-salt[1] Odyssey[1] Pursuit Reglone[3] Sencor Topside[1] Tropotox Plus[1]	Advance 10G Bonanza Gramoxone[2] Reglone[3] Rival Treflan		Edge Gramoxone[2] MCPA Amine Odyssey[1] Reglone[3]	
Potatoes **Irrigated (irr)**	Dual II Magnum Eptam Gramoxone[2] Reglone[3]	Gramoxone[2] Reglone[3] Sencor	Gramoxone[2] Linuron 480 Lorox Reglone[3]		Gramoxone[2] Linuron 480 Reglone[3]	
Rutabagas	Eptam Gramoxone[2]	Gramoxone[2]	Bonanza Gramoxone[2]	Rival Treflan	Gramoxone[2]	
Tame Buckwheat						

[1] Suppression only

[2] Pre-emergence to crop, post-emergent to weeds

[3] Used as a crop desiccant

Herbicide Selector Chart – Other Crops

Crop	Lamb's-quarters			Mustards		
Beans – **Dry, Snap**	Basagran Bonanza Edge	Eptam Gramoxone[2] Reglone[3]	Rival 500/DF Treflan	Basagran Gramoxone[2]	Reglone[3]	
Canary Grass	Badge Banvel II & Mixes Buctril M	Mextrol Pardner	Sword Target	Badge Banvel II + MCPA Buctril M	Mextrol Pardner	Sword Target
Carrots (C) and Parsnips	Bonanza (C) Gramoxone[2] (C)	Linuron 480 Lorox (C)	Rival 500/DF (C) Treflan (C)	Gramoxone[2] (C) Linuron 480	Lorox (C)	
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Atrazine Badge Banvel II + 2,4-D (FC) Basagran Bladex Buctril M Caliber 400 (FC) Clovitox Plus (FC) Cobotox 600 (FC)	DyVel DS 2,4-D Embutox 625 (FC) Eradicane 8-E Gramoxone[2] Laddok Linuron 480 (FC) Lorox L (FC) MCPA Amine (FC)	MCPA K-salt (FC) MCPA Na-salt (FC) Mextrol Pardner Primextra Princep SEE 2,4-DB (FC) Topside (FC) Tropotox Plus (FC)	Atrazine Badge Banvel II + 2,4-D (FC) Basagran Bladex Buctril M Caliber 400 (FC)	Cobutox 600 (FC) DyVel DS 2,4-D Embutox 625 (FC) Gramoxone[2] Korii Laddok Linuron 480 (FC)	Lorox L (FC) MCPA Amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Mextrol Pardner Primextra SEE 2,4-DB (FC)
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)			Roundup (RR) Factor (RR)		
Fababeans	Advance 10G Basagran Bonanza	Edge Rival	Sencor Treflan	Basagran Sencor		
Lentils	Advance 10G Assure II Bonanza	Reglone[3] Rival	Sencor Treflan	Reglone[3] Sencor		
Peas – **Field and Processing** Check label to ensure chosen chemical or mix is registered for use on the crop.	Advance 10G Assure II Basagran Bonanza Clovitox Plus Edge	Gramoxone[2] MCPA Amine MCPA Na-salt Odyssey[1] Pea Pack Reglone[3]	Rival Sencor Topside Treflan Tropotox Plus	Basagran Clovitox Plus Gramoxone[2] MCPA Amine	MCPA Na-salt Odyssey Pea Pack Pursuit	Reglone[3] Sencor Topside Tropotox Plus
Potatoes **Irrigated (irr)**	Eptam (Irish) Gramoxone[2]	Linuron 480 Lorox	Reglone[3] Sencor	Gramoxone[2] Linuron 480	Lorox Reglone[3]	Sencor
Rutabagas	Bonanza Eptam	Gramoxone[2] Rival 500/DF	Treflan	Gramoxone[2]		
Tame Buckwheat						

[1] Suppression only
[2] Pre-emergence to crop, post-emergent to weeds
[3] Used as a crop desiccant

Herbicide Selector Chart – Other Crops

Crop	Night-flowering Catchfly	Perennial Sow-thistle		Persian Darnel		
Beans – **Dry, Snap**	Regione[3]	Gramoxone[2] Regione[3]		Bonanza Centurion Gramoxone[2]	Hoe-Grass 284 Poast Ultra Regione[3]	Rival 500/DF Select Treflan
Canary Grass	Badge Buctril M Mextrol Pardner Sword Target	Badge[1] Banvel II[1] Buctril M[1] MCPA[1] (all)	Mextrol[1] Sword Target[1]			
Carrots (C) and Parsnips	Gramoxone[2] (C)	Gramoxone[2] (C)	Linuron 480 (C) (seedling only)	Bonanza (C) Gramoxone[2] (C)	Hoe-Grass 284 (C) Rival 500/DF (C)	Treflan (C)
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Badge Buctril M Gramoxone[1,2] Koril Mextrol Pardner	Amitrol 240 (spot) Badge[1] Banvel II + 2,4-D (FC) Buctril M[1] Caliber 400[1] (FC) Clovitox Plus[1] (FC) Cobutox 600[1] (FC) 2,4-D[1]	DyVel DS Embutox 625[1] (FC) Gramoxone[2] MCPA[1] (FC) MCPA K-salt (FC) SEE 2,4-DB (FC) Mextrol[1] (per.) Topside[1] (FC) Tropotox Plus[1] (FC)	Gramoxone[2] (C)		
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)	Roundup (RR) Factor (RR)				
Fababeans				Advance 10G Edge	Hoe-Grass 284 Poast Ultra	Rival Treflan
Lentils	Regione[3] Sencor	Glyphosate* (pre-harvest)	Regione[3]	Advance 10G Bonanza Centurion Fusion	Hoe-Grass 284 Poast Ultra Regione[3] Rival	Select Treflan Venture
Peas – **Field and Processing** Check label to ensure chosen chemical or mix is registered for use on the crop.	Gramoxone[1,2] Regione[3] Sencor	Amitrol 240 (spot) Clovitox Plus[1] Glyphosate* (pre-harvest) Gramoxone[2]	MCPA Amine[1] MCPA Na-salt[1] Regione[3] Topside[1] Tropotox Plus[1]	Advance 10G Centurion Fusion Gramoxone[2]	Hoe-Grass 284 Odyssey Poast Ultra Regione[3]	Rival Select Treflan Venture
Potatoes	Gramoxone[2] Regione[3] Sencor	Gramoxone[2] Linuron 480 (seedling only)	Regione[3]	Centurion Gramoxone[2] Poast Ultra	Regione[3] Select Venture	
Rutabagas	Gramoxone[2]	Gramoxone[2]		Bonanza Gramoxone[2]	Rival 500/DF Treflan	
Tame Buckwheat				Hoe-Grass 284 Poast Ultra		

[1] Suppression only

[2] Pre-emergence to crop, post-emergent to weeds

[3] Used as a crop desiccant

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Other Crops

Crop	Prostrate Pigweed		Purslane		Quack Grass	
Beans – Dry, Snap	Advance 10G Bonanza Edge Eptam	Gramoxone[2] Reglone[3] Rival Treflan	Advance 10G Basagran[1] Bonanza Edge Eptam Gramoxone[2]	Hoe-Grass 284 Poast Ultra Reglone[3] Rival 500/DF Treflan	Amitrol 240 (whitebean) Centurion Eptam	Glyphosate* (pre-harvest) Poast Ultra Reglone[3] Select
Canary Grass	Banvel II + MCPA	Sword Target				
Carrots (C) and Parsnips	Bonanza (C) Gramoxone[2] (C) Linuron 480	Lorox Rival Treflan (C)	Bonanza (C) Gramoxone[2] (C) Linuron 480	Lorox (C) Rival 500/DF (C) Treflan	Gramoxone[2] (C)	
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Banvel II + 2,4-D (FC) Bladex DyVel DS 2,4-D	Eradicane 8-E Linuron 480 Lorox Gramoxone[2] MCPA-K (FC) Primextra	Atrazine Basagran Bladex 2,4-D Eradicane 8-E Gramoxone[2] Laddok Linuron 480 (FC)	Lorox L (FC) MCPA Amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Primextra Princep Simazine 80W	Accent (FC) Amitrol 240 Eradicane 8-E Gramoxone[2]	
Roundup Ready Corn (RR)					Roundup (RR) Factor (RR)	
Fababeans	Advance 10G Bonanza Edge	Rival Treflan	Advance 10G Basagran Bonanza	Edge Rival Treflan	Poast Ultra	
Lentils	Advance 10G Bonanza Reglone[3]	Rival Treflan	Advance 10G Bonanza Reglone[3]	Rival Treflan	Assure II Centurion Glyphosate* (pre-harvest)	Poast Ultra Reglone[3] Select
Peas – Field and Processing Check label to ensure chosen chemical or mix is registered for use on the crop.	Advance 10G Bonanza Edge Gramoxone[2]	Reglone[3] Rival Treflan	Advance 10G Basagran Edge Gramoxone[2] MCPA Amine	MCPA Na-salt Reglone[3] Rival Treflan	Assure II Centurion Glyphosate* (pre-harvest) Gramoxone[2]	NaTA (field) Poast Ultra Reglone[3] Select
Potatoes	Eptam (Irish) Gramoxone[2] Linuron 480	Lorox Reglone[3]	Eptam (Irish) Gramoxone[2] Linuron 480	Lorox Reglone[3]	Centurion Eptam (Irish) Gramoxone[2] Poast Ultra	Prism (irr) Reglone[3] Select
Rutabagas	Eptam	Gramoxone[2]	Bonanza Eptam Gramoxone[2]	Rival 500/DF Treflan	Eptam Gramoxone[2]	
Tame Buckwheat					Poast Ultra	

[1] Suppression only

[2] Pre-emergence to crop, post-emergent to weeds

[3] Used as a crop desiccant

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Other Crops

Crop	Redroot Pigweed			Russian Pigweed	Russian Thistle	
Beans – Dry, Snap	Advance 10G Basagran Bonanza	Edge Eptam Gramoxone[2]	Reglone[3] Rival 500/DF Treflan	Reglone[3]	Basagran Gramoxone[2]	Reglone[3] Rival 500/DF
Canary Grass	Badge Banvel II + MCPA Buctril M	Mextrol Pardner	Sword Target		Badge Buctril M Mextrol	Pardner Sword Target
Carrots (C) and Parsnips	Bonanza (C) Gramoxone[2] (C)	Linuron 480 (C) Lorox (C)	Rival (C) Treflan (C)	Gramoxone[2] (C)	Gramoxone[2] (C) Rival 500/DF (C)	
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Atrazine Badge Banvel II + 2,4-D (FC) Basagran[1] Bladex Buctril M Caliber 400 (FC) Clovitox Plus (FC) Cobutox 600 (FC)	DyVel DS 2,4-D Embutox 625 (FC) Eradicane 8-E Gramoxone[2] Koril Laddok Linuron 480 (FC) Lorox L (FC)	MCPA Amine (FC) MCPA K-salt MCPA Na-salt Mextrol Pardner Primextra SEE 2,4-DB (FC) Topside (FC) Tropotox Plus (FC)	Banvel II + 2,4-D (FC) 2,4-D Gramoxone[2] MCPA Amine (FC) MCPA K-salts (FC) MCPA Na-salt (FC)	Badge Banvel II + 2,4-D (FC) Basagran Bladex Buctril M 2,4-D	DyVel DS Gramoxone[2] Koril Laddok Mextrol Pardner
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)				Roundup (RR) Factor (RR)	
Fababeans	Advance 10G Basagran[1]	Bonanza Edge	Rival Treflan		Advance 10G Basagran[1] Bonanza	Edge Rival Sencor[1]
Lentils	Advance 10G Reglone[3]	Rival Sencor	Treflan	Reglone[3]	Advance 10G Bonanza Reglone[3]	Rival Sencor
Peas – Field and Processing Check label to ensure chosen chemical or mix is registered for use on the crop.	Advance 10G Basagran[1] Bonanza Clovitox Plus Edge Gramoxone[2]	MCPA Amine MCPA Na-salt Odyssey Pea Pack Pursuit Reglone[3]	Rival Sencor Topside Treflan Tropotox Plus	Gramoxone[2] MCPA Amine MCPA Na-salt Reglone[3]	Advance 10G Basagran Bonanza Edge[1]	Gramoxone[2] Reglone[3] Rival Sencor
Potatoes	Eptam (Irish) Gramoxone[2]	Linuron 480 Lorox Prism (irr)	Reglone[3] Sencor	Reglone[3]	Gramoxone[2] Reglone[3]	Sencor
Rutabagas	Bonanza Eptam	Gramoxone[2] Rival 500/DF	Treflan	Gramoxone[2]	Bonanza Gramoxone[2]	Rival 500/DF Treflan
Tame Buckwheat						

[1] Suppression only

[2] Pre-emergence to crop, post-emergent to weeds

[3] Used as a crop desiccant

Herbicide Selector Chart – Other Crops

Crop	Stinkweed		Tartary Buckwheat		Toadflax
Beans – Dry, Snap)	Basagran Gramoxone[2]	Reglone[3]	Gramoxone[2] Reglone[3]		
Canary Grass	Badge Banvel II + MCPA Buctril M Mextrol	Pardner Sword Target	Badge Banvel II Buctril M Mextrol	Pardner Sword Target	
Carrots (C) and Parsnips	Gramoxone[2] (C)	Linuron 480 (C) Lorox (C)	Gramoxone[2]		
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Badge Banvel II + 2,4-D (FC) Basagran Buctril M Caliber 400 (FC) Clovitox Plus (FC) Cobutox 600[1] (FC) 2,4-D DyVel DS Embutox 625 (FC)	Koril Linuron 480 (FC) Lorox L (FC) MCPA Amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) Mextrol Pardner SEE Butyric 480 (FC) Topside (FC) Tropotox Plus (FC)	Badge Banvel II + 2,4-D (FC) Buctril M 2,4-D[1] DyVel DS Gramoxone[2]	Koril MCPA Amine (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC) Mextrol Pardner	
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)				
Fababeans	Basagran	Sencor			
Lentils	Reglone[3] Sencor		Reglone[3] Sencor		Glyphosate* (pre-harvest)
Peas – Field and Processing Check label to ensure chosen chemical or mix is registered for use on the crop.	Basagran Clovitox Plus Gramoxone[2] MCPA Amine MCPA Na-salt Odyssey	Pea Pack Pursuit Reglone[3] Sencor Topside Tropotox Plus	Gramoxone[2] MCPA Amine[1] MCPA Na-salt[1] Reglone[3] Sencor		Glyphosate* (pre-harvest)
Potatoes	Gramoxone[2] Linuron 480 Lorox	Reglone[3] Sencor	Gramoxone[2] Reglone[3] Sencor		
Rutabagas	Gramoxone[2]		Gramoxone[2]		
Tame Buckwheat					

[1] Suppression only
[2] Pre-emergence to crop, post-emergent to weeds
[3] Used as a crop desiccant

* Glyphosate based chemicals are: Roundup Original, Roundup Transorb, Touchdown iQ, Vantage, Vantage Plus, Glyfos, Maverick, Renegade, Credit, Factor

Herbicide Selector Chart – Other Crops

Crop	Volunteer Cereals	Volunteer Oats	Volunteer Rapeseed
Beans – Dry, Snap	Centurion Edge Eptam Gramoxone[2] Poast Ultra Regione[3] Select	Bonanza Centurion Edge Eptam Hoe-Grass 284 Gramoxone[2] Poast Ultra Regione[3] Rival 500/DF Select Treflan	Gramoxone[2] Regione[3]
Canary Grass		Avenge	Badge Banvel II + MCPA Buctril M Mextrol Sword Target
Carrots (C) and Parsnips	Gramoxone[2] (C)	Bonanza (C) Gramoxone[2] (C) Hoe-Grass 284 (C) Rival 500/DF (C) Treflan (C)	Gramoxone[2]
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Eradicane 8-E Gramoxone[2]	Accent (FC) Atrazine Eradicane 8-E Gramoxone[2] Princep Simazine 80W	Badge Buctril M Clovitox Plus (FC) DyVel DS Gramoxone[2] Mextrol Topside (FC) Tropotox Plus (FC)
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)	Roundup (RR) Factor (RR)	Roundup (RR) Factor (RR)
Fababeans	Edge Poast Ultra	Advance 10G Bonanza Edge Hoe-Grass 284 Poast Ultra Rival Treflan	Lexone Sencor
Lentils	Assure II Centurion Fusion Poast Ultra Select Regione[3] Venture	Advance 10G Assure II Bonanza Centurion Fusion Hoe-Grass 284 Poast Ultra Regione[3] Rival Select Treflan Venture	Regione[3] Sencor
Peas – Field and Processing Check label to ensure chosen chemical or mix is registered for use on the crop.	Assure II Centurion Edge Fusion Gramoxone[2] Odyssey Poast Ultra Regione[3] Select Venture	Advance 10G Assure II Avadex BW Bonanza Centurion Edge Fusion Gramoxone[2] Hoe-Grass 284 Odyssey Poast Ultra Pursuit Regione[3] Rival Select Treflan Venture	Clovitox Plus Gramoxone[2] Odyssey Pea Pack Pursuit Regione[3] Sencor Topside Tropotox Plus
Potatoes	Centurion Eptam (Irish) Gramoxone[2] Poast Ultra Regione[3] Select Venture	Centurion Eptam (Irish) Gramoxone[2] Hoe-Grass 284 Poast Ultra Regione[3] Select Venture	Gramoxone[2] Regione[3] Sencor
Rutabagas	Eptam Gramoxone[2]	Bonanza Eptam Gramoxone[2] Rival 500/DF Treflan	Gramoxone[2]
Tame Buckwheat	Poast Ultra	Poast Ultra Hoe-Grass 284	

[1] Suppression only

[2] Pre-emergence to crop, post-emergent to weeds

[3] Used as a crop desiccant

Herbicide Selector Chart – Other Crops

Crop	Wild Buckwheat		Wild Oats		Wild Radish	
Beans – **Dry, Snap**	Advance 10G Bonanza Edge Gramoxone[2]	Reglone[3] Rival 500/DF Treflan	Bonanza Centurion Edge Eptam Hoe-Grass 284 Gramoxone[2]	Poast Ultra Reglone[3] Rival 500/DF Select Treflan	Basagran Gramoxone[2] Reglone[3]	
Canary Grass	Badge Banvel II Buctril M Mextrol	Pardner Sword Target	Avenge		Banvel II + MCPA	
Carrots (C) and Parsnips	Bonanza (C) Gramoxone[2] (C) Linuron 480 L	Lorox (C) Rival (C) Treflan (C)	Bonanza (C) Gramoxone[2] (C) Hoe-Grass 284 (C)	Rival 500/DF (C) Treflan (C)	Gramoxone[2] (C) Linuron 480	
Corn Check label to ensure chosen chemical or mix is registered for use on the crop. **Field Corn Only (FC)**	Atrazine Badge Banvel II (FC) Bladex Buctril M Caliber 400 (FC) Cobutox 600 (FC) 2,4-D[1] DyVel DS Embutox 625 (FC) Gramoxone[2] Koril	Lorox L (FC) MCPA Amine[1] (FC) MCPA K-salt[1] (FC) MCPA Na-salt[1] (FC) Mextrol Pardner Primextra Princep SEE 2,4-DB (FC) Simazine 80W	Accent (FC) Atrazine Eradicane 8-E	Gramoxone[2] Princep Simazine 80W	Banvel II + 2,4-D (FC) Basagran[1] Caliber 400 (FC) Clovitox Plus[1] (FC) Cobutox 400 2,4-D Embutox 625 (FC)	Gramoxone[2] MCPA Amine (FC) MCPA K-salt (FC) MCPA Na-salt (FC) SEE 2,4-DB (FC) Topside[1] (FC) Tropotox Plus[1] (FC)
Roundup Ready Corn (RR)	Roundup (RR) Factor (RR)		Roundup (RR) Factor (RR)			
Fababeans	Advance 10G Bonanza Edge	Rival Treflan	Advance 10G Bonanza Edge Hoe-Grass 284	Poast Ultra Rival Treflan	Basagran	
Lentils	Advance 10G Bonanza Reglone[3]	Rival Treflan	Advance 10G Assure II Bonanza Centurion Fusion Hoe-Grass 284	Poast Ultra Reglone[3] Rival Select Treflan Venture	Reglone[3]	
Peas – **Field and Processing** Check label to ensure chosen chemical or mix is registered for use on the crop.	Advance 10G Bonanza Edge Gramoxone[2] MCPA Amine[1] MCPA Na-salt[1]	Odyssey[1] Pursuit Reglone[3] Rival Treflan	Advance 10G Assure II Avadex BW Bonanza Centurion Edge Fusion Gramoxone[2] Hoe-Grass 284	Odyssey Poast Ultra Pursuit Reglone[3] Rival Select Treflan Venture	Basagran Clovitox Plus[1] Gramoxone[2] MCPA Amine	MCPA Na-salt Reglone[3] Topside[1] Tropotox Plus[1]
Potatoes	Gramoxone[2] Linuron 480 L	Lorox Reglone[3]	Centurion Eptam (Irish) Gramoxone[2] Hoe-Grass 284	Poast Ultra Reglone[3] Select Venture	Gramoxone[2]	Reglone[3]
Rutabagas	Bonanza Gramoxone[2]	Rival Treflan	Bonanza Eptam Gramoxone[2]	Rival 500/DF Treflan	Gramoxone[2]	
Tame Buckwheat			Poast Ultra	Hoe-Grass 284		

[1] Suppression only

[2] Pre-emergence to crop, post-emergent to weeds

[3] Used as a crop desiccant

Insecticide Selector Chart

	Beetles					Stored Grain Insects
Crop	**Blister**	**Colorado Potato**	**Flea**	**Red Turnip**	**Sunflower Beetle**	**Flour Beetles, Grain Beetles, Mediterranean Flour Moth**
Barley, Oats, Wheat						Malathion Phostoxin
Rye						Malathion Phostoxin
Field Corn (FC) Sweet Corn (SC)			Poncho			Malathion (FC) Phostoxin
Alfalfa	Sevin	Dibrom Imidan	Dibrom			
Clover	Sevin	Dibrom	Dibrom Sevin			
Pasture		Dibrom	Dibrom			
Canola			Counter Cymbush Decis Furadan Fyfanon Gaucho 480 Gaucho CS Helix[1] Helix XTra[1] Lindane Malathion Matador Poncho Prosper Ripcord Sevin	Furadan		
Flax						
Mustard			Counter Cymbush Decis Furadan Gaucho 480 Gaucho CS Helix[1] Helix XTra[1] Malathion Matador	Furadan		
Sunflower					Cymbush Decis Endosulfan Matador Ripcord Thiodan Thionex	
Sugar Beets		Dibrom	Dibrom Fyfanon Malathion			
Peas						
Potato		Admire APM Cymbush Decis Dibrom Endosulfan Furadan Fyfanon Genesis Guthion Imidan Lorsban Malathion Matador Monitor Nufos Orthene Pounce Pyrinex Ripcord Sevin Sniper Thimet Thiodan Thionex	APM Cymbush Decis Dibrom Endosulfan Furadan Genesis Imidan Lannate Lorsban Matador Monitor Nufos Orthene Pounce Pyrinex Ripcord Sevin Sniper Thimet Thiodan Thionex			

NOTE:
Insecticides listed by trade name

[1] Commercial seed treatment only

Insecticide Selector Chart

	Butterflies & Moths					
Crop	**Alfalfa Looper**	**Armyworms**	**Bertha Armyworm* or Clover Cutworm****	**Webworm**	**Cutworms – Army, Pale Western, Red-backed**	**Diamond-back Moth Larvae**
Barley, Oats, Wheat		Dylox Guthion Lannate Lorsban Malathion Matador Nufos Pyrinex Sevin Sniper			Decis Lorsban Nufos Pounce (Pale Western only) Pyrinex Ripcord (B,W)	
Rye		Dylox Guthion Lorsban Malathion Nufos Pyrinex Sevin			Pounce (Pale Western only)	
Field Corn (FC) **Sweet Corn (SC)**		Dylox Lannate (FC) Matador Sevin			Lorsban Nufos Poncho Pyrinex Ripcord	
Alfalfa	Dibrom	Dylox Matador Sevin		Dylox Sevin		
Clover	Dibrom	Sevin		Sevin		
Pasture	Dibrom	Matador				
Canola	Lannate Lorsban Nufos Pyrinex	Lorsban Matador Nufos Pyrinex	Cymbush* Decis* Lannate Lorsban* Monitor* Nufos Pyrinex Ripcord*	Dylox Lannate	Lorsban Nufos Pyrinex	Decis Dylox Fyfanon Lorsban Malathion Nufos Pyrinex
Flax		Dylox Matador	Lannate* Decis** Dylox* Lorsban*	Decis Dylox	Decis Lorsban Nufos Pyrinex	
Mustard		Matador	Cymbush* Decis*		Lorsban Nufos Pyrinex	Decis Malathion
Sunflower		Matador			Lorsban Nufos Pyrinex	
Sugar Beets	Dibrom	Dylox		Dylox Endosulfan Thiodan Thionex	Lorsban Nufos Pounce Pyrinex	
Peas	Lannate					
Potato	Dibrom	Matador			Lorsban Nufos Pyrinex Ripcord	

NOTE:

Insecticides listed by trade name

[1] Commercial seed treatment only

Insecticide Selector Chart

	Butterflies & Moths		Flies		Grasshoppers
Crop	**European Corn Borer* or Corn Earworm****	**Flax Bollworm**	**Root Maggots – Seed Corn, Sugar Beet**	**Wheat Midge**	**Clear winged, Migratory, Two-striped**
Barley, Oats, Wheat	Matador			Cygon Lagon Lorsban Nufos Pyrinex	Cygon Decis Furadan Lorsban Malathion Matador Nufos Pyrinex Ripcord (B,W) Sevin
Rye					Cygon Dimethoate ECO Bait Fyfanon Guthion Lagon Malathion Sevin
Field Corn (FC) Sweet Corn (SC)	Cymbush Decis* (FC) Endosulfan Furadan* Fyfanon Lannate (SC) Malathion (FC) Matador Orthene Pounce (SC) Ripcord Sevin Thiodan** Thionex**		Counter DCT (SC) Poncho		ECO Bait Sevin
Alfalfa	Matador				APM Cygon ECO Bait Dibrom Furadan Fyfanon Guthion Lagon Malathion Sevin Sniper
Clover					APM Cygon ECO Bait Dibrom Furadan Fyfanon Guthion Malathion Sevin Sniper
Pasture	Matador				Cygon Decis ECO Bait Dibrom Furadan Lagon Malathion Matador Sevin
Canola	Matador		Counter (reduced feeding)		Cygon ECO Bait Furadan Fyfanon Lagon Lorsban Malathion Matador Monitor Nufos Pyrinex Ripcord
Flax	Matador	Lannate			Decis Fyfanon Malathion
Mustard	Matador		Counter (reduced feeding)		Malathion Matador [1]
Sunflower	Matador				Cygon Dimethoate Lagon
Sugar Beets			Counter Furadan		Dibrom
Peas					
Potato	Matador				Dibrom

NOTE:
Insecticides listed by trade name
[1] Commercial seed treatment only

Insecticide Selector Chart

	Plant Bugs	Mites	Sucking Insects	
Crop	**Alfalfa, Lygus, Stink, Superb, Tarnished**	**Brown Wheat, Two-spotted, Winter Grain**	**Aphids – Corn Leaf, Green Bug, Green Peach, English Grain, Pea, Russian**	**Potato Leafhoppers**
Barley, Oats, Wheat		Lorsban Malathion Pyrinex	Cygon Fyfanon Lagon Lorsban Malathion Nufos Pyrinex	
Rye			Cygon Fyfanon Lagon Malathion	
Field Corn (FC) Sweet Corn (SC)			Endosulfan Poncho Thiodan Thionex	
Alfalfa	APM Cygon Decis* Dibrom Dylox Endosulfan Fyfanon Guthion Lagon Malathion Sniper Thiodan * Seed Production Only	Guthion Malathion	APM Cygon Dibrom Endosulfan Fyfanon Guthion Imidan Lagon Malathion Sniper Thiodan Thionex	APM Cygon Guthion Imidan Malathion Sevin Sniper
Clover	Cygon Dibrom Guthion Malathion Sniper	Malathion	APM Cygon Dibrom Lagon Sniper	APM Cygon Lagon Sniper
Pasture	Cygon Dibrom Lagon		Cygon Dibrom Dimethoate Lagon	Cygon Dimethoate Lagon
Canola	Decis Dylox Lorsban			
Flax				
Mustard				
Sunflower				
Sugar Beets	Dibrom		Dibrom Endosulfan Thiodan Thionex	
Peas			Cygon Endosulfan Lagon Lannate Thiodan Thionex	
Potato	APM Cymbush Decis Dibrom Endosulfan Furadan Guthion Lorsban Matador Nufos Orthene Pounce Pyrinex Ripcord Sniper Thiodan		APM Cygon Dibrom Furadan Genesis Guthion Lannate Lagon Malathion Monitor Orthene Sniper Thimet Thiodan Thionex	Ambush APM Cygon Cymbush Decis Endosulfa Furadan Fyfanon Genesis Guthion Lagon Lannate Malathion Matador Monitor Orthene Pounce Ripcord Sevin Sniper Thimet Thiodan Thionex

NOTE:
Insecticides listed by trade name
[1] Commercial seed treatment only

Insecticide Selector Chart

	Sucking Insects	**Thrips**	**Weevils**	**Wireworms**
Crop	**Spittlebugs**	**Barley, Grass, Red Clover**	**Alfalfa, Sunflower, Sweet Clover**	
Barley, Oats, Wheat		Cygon Dimethoate Fyfanon Lagon Lannate Malathion		
Rye				
Field Corn (FC) Sweet Corn (SC)				Poncho
Alfalfa	APM Endosulfan Fyfanon Guthion Malathion Sniper Thiodan Thionex		APM Cygon Decis* Dimethoate Furadan Fyfanon Guthion Imidan Lagon Malathion Sevin Sniper *Seed Production Only	
Clover	APM Endosulfan Fyfanon Guthion Malathion Sniper Thiodan Thionex		Cygon Dimethoate Guthion Lagon Malathion Sevin Sniper	
Pasture				
Canola				
Flax				
Mustard				
Sunflower			Lorsban Nufos Pyrinex	
Sugar Beets				Counter
Peas			Endosulfan Thiodan Thionex	
Potato	APM Guthion Sniper			Thimet[1]

NOTE:
Insecticides listed by trade name

[1] Commercial seed treatment only

Fungicide Selector Chart

Crop	Alternaria/ Black Spot	Blackleg	Bunt – Stinking Smut	Crown Rust	Fusarium Head Blight	Fusarium Seedling Blight
Barley						Raxil FL
Wheat			Baytan 30[2] Dithane M-22 Dividend XL RTA Raxil FL Vitaflo 280 Vitavax Powder Vitavax Single Solution		Bravo 500[3]	Dividend XL RTA Raxil FL
Oats				Stratego Tilt		
Rye						
Brome Grass						
Canola	Foundation Lite Quadris Rovral Flo[3]	Foundation Lite Helix[2] Helix XTra[2] Quadris Tilt Vitavax rs Fungicide				
Flax						
Mustard	Foundation Lite	Foundation Lite Helix[2] Helix XTra[2] Vitavax rs Fungicide				

[1] Except Palliser
[2] Commercial seed treatment only
[3] Suppression only
[4] Sweet corn only
[5] Low tannin lentils only

Fungicide Selector Chart

Crop	Leaf Rust	Leaf Stripe	Net Blotch	Powdery Mildew	Scald	Sclerotinia Stem Rot
Barley	Tilt	Baytan 30[2] Vitavax Single Solution[3]	Baytan 30[2,3] Stratego Tilt Vitavax Single Solution[3]	Tilt	Baytan 30[2,3] Headline Stratego Tilt	
Wheat	Dithane DG Rainshield NT Headline Stratego Tilt			Baytan 30[2] Headline Stratego Tilt		
Oats						
Rye	Headline					
Brome Grass						
Canola						Benlate Lance Quadris Ronilan EG Rovral Flo
Flax						
Mustard						
Cucumber				Kumulus DF		
Peas				Headline Kumulus DF		Quadris
Saskatoon Berries				Kumulus DF		

[1] Except Palliser
[2] Commercial seed treatment only
[3] Suppression only
[4] Sweet corn only
[5] Low tannin lentils only

Fungicide Selector Chart

Crop	Root Rot	Seedling Blight (*Pythium*)	Seedling Blight (*Rhizoctonia*)	Seedling Blight Seed Rot Damping Off	Septoria Leaf Blotch
Barley	Baytan 30[2,3] Vitavax Single Solution[3]			Vitaflo 280 Vitavax Powder Vitavax Single Solution	Stratego Tilt
Wheat	Dividend XL RTA[3] Raxil FL Vitavax Single Solution[3]			Dividend XL RTA Vitaflo 280 Vitavax Single Solution	Bravo 500 Dithane DG Rainshield NT Dividend XL RTA Stratego Tilt
Oats	Vitavax Single Solution[3]			Vitaflo 280 Vitavax Single Solution	Stratego Tilt
Rye	Vitavax Single Solution[3]			Vitaflo 280 Vitavax Powder	
Brome Grass		Apron FL[2]			
Canola		Apron FL[2] Vitavax rs Fungicide	Foundation Lite Vitavax rs Fungicide	Helix[2] Helix XTra[2] Premiere Plus Rovral Flo Rovral WP	
Flax	N-M Drill Box			Vitaflo 280 Vitavax Powder Vitavax Single Solution	
Mustard		Vitavax rs Fungicide	Foundation Lite Vitavax rs Fungicide	Helix[2] Helix XTra[2] Thiram 75 WP	
Sweet Corn				DCT	

[1] Except Palliser
[2] Commercial seed treatment only
[3] Suppression only
[4] Sweet corn only
[5] Low tannin lentils only

Fungicide Selector Chart

Crop	Smut – Covered, Loose	Stem Rust	Stem Smut	Stripe Rust	Take All	Tan Spot
Barley	Baytan 30[2] Charter Raxil FL Vitaflo 280 Vitavax Powder Vitavax Single Solution	Tilt		Headline		
Wheat	Baytan 30[2] Charter Dividend XL RTA Raxil FL Vitavax Single Solution	Stratego Tilt		Headline Stratego Tilt	Baytan 30[2,3] Dividend XL RTA[3]	Bravo 500 Dithane DG Rainshield NT Headline Stratego Tilt
Oats	Charter Vitaflo 280 Vitavax Powder Vitavax Single Solution					
Rye			Vitaflo 280 Vitavax Powder Vitavax Single Solution			
Brome Grass	Vitavax Powder					
Canola						
Flax						
Mustard						

[1] Except Palliser
[2] Commercial seed treatment only
[3] Suppression only
[4] Sweet corn only
[5] Low tannin lentils only

Fungicide Selector Chart

Crop	Ascochyta Leaf Blight	Blackleg	Botrytis Vine Rot	Cercospora Leaf Spot	Common Scab	Early Blight	Fusarium Decay	Late Blight
Peas	Bravo 500	Quadris						
Potato		Quadris Senator PSPT Polyram 16D	Bravo 500 Ridomil Gold/ Bravo		Captan FL Polyram 16D	Acrobat MZ Bravo 500 Dithane M-22 Gavel 75 DF Headline Lance Manzate 200 Polyram 16D Polyram DF Ridomil Gold/ Bravo Ridomil Gold MZ	Senator PSPT Manzate 200 Polyram 16D Tuberseal	Acrobat MZ Bravo 500 Curzate 60 DF Dithane M-22 Gavel 75 DF Headline Lance Manzate 200 Polyram 16D Polyram DF Ridomil Gold/ Bravo Ridomil Gold MZ Tattoo C
Soybean		Tilt						
Sugar Beets				Headline Manzate 200 Mertect SC Polyram DF				

[1] Except Palliser

[2] Commercial seed treatment only

[3] Suppression only

[4] Sweet corn only

[5] Low tannin lentils only

Fungicide Selector Chart

Crop	Phytophthora	Powdery Mildew	Seedling Blight (*Pythium*)	Seedling Blight (*Rhizoctonia*)	Root Rot	Seedling Blight Seed Rot Damping Off	Verticillium Wilt Silver Scurf
Peas		Headline Kumulus DF	Apron FL[2]		Captan FL	Apron FL[2] Captan FL Thiram 75 WP	
Potato				Maxim PSP		Acrobat MZ Captan FL Senator PSPT	Senator PSPT
Soybean	Apron FL[2]	Tilt	Apron FL[2]		Captan FL	Captan FL Thiram 75 WP Vitaflo 280 Vitavax Powder	
Sugar Beets		Headline	Apron FL[2]		Captan FL	Apron FL[2] Captan FL Thiram 75 WP	

[1] Except Palliser
[2] Commercial seed treatment only
[3] Suppression only
[4] Sweet corn only
[5] Low tannin lentils only

Fungicide Selector Chart

Crop	Anthracnose	Ascochyta	Black Scurf	Blackleg	Botrytis	Downy Mildew	Fusarium Dry Rot
Beans (Dry, Snap)	DCT		Maxim PSP	Quadris Tilt	Benlate Ronilan EG Rovral	Headline	Maxim PSP
Cole Crops: (Broccoli, Brussel Sprouts, Cabbage, Cauliflower)							
Field Corn (FC) Sweet Corn (SC)			Maxim PSP				Maxim PSP
Grasses			Maxim PSP				Maxim PSP
Lentils	Bravo 500 Headline	Bravo 500 Crown Headline Lance		Quadris			
Potato			Maxim PSP	Quadris			Maxim PSP
Safflower							
Seed Alfalfa							
Sunflower					Benlate	Apron FL[2]	

[1] Except Palliser
[2] Commercial seed treatment only
[3] Suppression only
[4] Sweet corn only
[5] Low tannin lentils only

Fungicide Selector Chart

Crop	Silver Scurf (*Helmenthosporium Solani*)	Root Rot	Rust	Sclerotinia	Seedling Blight Seed Rot Damping Off	Seedling Blight (*Pythium*)	Verticillium Wilt
Beans (Dry, Snap)	Maxim PSP	Captan FL	Headline Tilt	Benlate Quadris Rovral	Captan FL Thiram 75 WP Vitaflo 280	Apron FL[2] DCT	
Cole Crops: (Broccoli, Brussel Sprouts, Cabbage, Cauliflower)							
Field Corn (FC) Sweet Corn (SC)	Maxim PSP	Captan FL Manzate 200	Bravo 500[4]		Captan FL Manzate 200 Thiram 75 WP (SC) Vitaflo 280	Apron FL[2]	
Grasses	Maxim PSP				Thiram 75 WP	Apron FL[2]	
Lentils				Quadris	Crown	Apron FL[5]	
Potato	Maxim PSP			Quadris			
Safflower					Thiram 75 WP		
Seed Alfalfa				Benlate	Apron FL[2]	Apron FL[2]	Thiram 75 WP
Sunflower						Apron FL[2]	

[1] Except Palliser
[2] Commercial seed treatment only
[3] Suppression only
[4] Sweet corn only
[5] Low tannin lentils only

Pesticide Application Record

Field description: ______________________ **Acres:** ______ **Crop:** ______________

Variety: __________ **Date seeded:** __________ **Fertilizer:** __________ **Rate:** ______ **Date:** __________

Crop stage: ______________ **Scouting date:** __________ **Date results were checked:** __________

Pest Weed/Insect/Disease		Density				Results	Field Diagram
Species	Leaf stage/ Instar/Symptom	Patches	Low	Medium	High		

Comments: ____

Application Information							Environment Information			
Pesticide used	Date and time	Rate per acre	Water volume per acre	Acres per tank	Pesticide volume per tank	Tanks per field	Crop stand	Soil moisture	Temp-erature	Wind speed and direction
1 Lot #: ______							Ex. .... G. .... Fr. .... Pr.	Ex. .... G. .... Fr. .... Pr.		
2 Lot #: ______							Ex. .... G. .... Fr. .... Pr.	Ex. .... G. .... Fr. .... Pr.		
3 Lot #: ______							Ex. .... G. .... Fr. .... Pr.	Ex. .... G. .... Fr. .... Pr.		

Comments: ____

Note: Ex. = Excellent G. = Good Fr. = Fair Pr. = Poor

Pesticide Application Record

Field description: ____________________ **Acres:** ______ **Crop:** ____________

Variety: __________ **Date seeded:** __________ **Fertilizer:** __________ **Rate:** ______ **Date:** __________

Crop stage: ____________________ **Scouting date:** __________ **Date results were checked:** __________

Pest Weed/Insect/Disease		Density				Results	Field Diagram
Species	Leaf stage/ Instar/Symptom	Patches	Low	Medium	High		

Comments: ____

____

Application Information							Environment Information			
Pesticide used	Date and time	Rate per acre	Water volume per acre	Acres per tank	Pesticide volume per tank	Tanks per field	Crop stand	Soil moisture	Temp- erature	Wind speed and direction
1 Lot #: ______							Ex. .... G. .... Fr. .... Pr.	Ex. .... G. .... Fr. .... Pr.		
2 Lot #: ______							Ex. .... G. .... Fr. .... Pr.	Ex. .... G. .... Fr. .... Pr.		
3 Lot #: ______							Ex. .... G. .... Fr. .... Pr.	Ex. .... G. .... Fr. .... Pr.		

Comments: ____

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Note: Ex. = Excellent G. = Good Fr. = Fair Pr. = Poor

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3. Be prepared to answer some questions.
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   b. name and amount of product
   c. **time poisoning happened**
   d. **any symptoms**
   e. **circumstances surrounding the incident**
   f. **your name and phone number**
4. Follow instructions carefully.
5. Keep your line free if the Poison Centre has to return your call.
6. **Do not attempt any additional first aid unless the Poison Centre has instructed you.**

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Southern Alberta Region

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